



## **Cisco Unified Communications System for IP Telephony Release 6.0(1)**

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# CHAPTER 1

## Home

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# Welcome to the Cisco Unified Communications IP Telephony Technical Information Site

This information site describes the Cisco Unified Communications IP telephony system, the Cisco IP solution for integrating data, voice, and video traffic over converged networks. The Cisco Unified Communications IP telephony system sets the world standard for rich-media IP networking.

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 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 link at the bottom of every TOC. To learn more about how to navigate through this site, see [Using This Information System](#).



### Note

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In addition to using the Feedback Form available on each page, you can e-mail comments to [CiscoUnifiedCommunicationsSystemDocFeedback@elink.cisco.com](mailto:CiscoUnifiedCommunicationsSystemDocFeedback@elink.cisco.com). Your feedback helps us to improve this site.

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### Audience

This technical information site is designed for people who are implementing Cisco Unified Communications IP telephony systems:

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

## The Critical Path to Successful Deployment

The PPDIIO 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 PPDIIO methodology. Each tab on the web interface contains a complete task flow for each phase of the PPDIIO process. [Table 1-1](#) shows you what type of content you will find on each process tab.

**Table 1-1**      **Site Content Map**

Phase	Content Overview
<a href="#">Prepare and Plan</a>	Using evaluative and planning tools, system engineers help partners and customers find the best solutions to their business needs. Further planning continues the needs analysis with the goal of producing a high-level project plan and the initial site survey.  Key Content: System description, Release Matrix, market descriptions, planning installations and upgrades
<a href="#">Design</a>	Using the verified customer requirements, the system engineer creates the detailed design, which includes the equipment list, network diagrams, and traffic flows.  Key Content: Sample deployment models, sample call flows, system test results
<a href="#">Implement</a>	Using the site requirements identified in the detailed design, the implementation team performs a detailed site survey is performed to prepare the site for installation. Equipment is ordered, inventoried, and staged. The implementation team uses the detailed design to install and configure equipment. A detailed test plan is developed and implemented to determine whether the network is ready for use.  Key Content: Installation guidelines, test configurations, introduction to troubleshooting methodology
<a href="#">Operate</a>	Ongoing operations include managing and monitoring components, performing routine maintenance, managing upgrades, and managing performance and service level agreements (SLA).  Key Content: Call load test results, tested call flows, troubleshooting common problems, recovery procedures
<a href="#">Optimize</a>	Optimization covers post installation services that are not under a maintenance contract including, but not limited to, performance audits, hardware and software upgrades, and applications development.  Key Content: Upgrade procedures
<a href="#">Resource Library</a>	Key Content: System description, release notes, topologies, ordering guides, configuration files, system test results, links to related documentation end-of-sale and end-of-life, and Cisco Unified Communications system demo
<a href="#">Training Library</a>	The Training Library provides a single interface to all Cisco Unified Communications instructor-led courses, quick learning modules (QLMs), and training videos on demand (VODs).

## About This Release

This documentation covers Cisco Unified Communications system applications through Release 6.0(1). If you are upgrading an existing Cisco Unified Communications system application, begin by reading the [Release Notes for Release 6.0\(1\)](#) to familiarize yourself with functionality in this new release.

There are two information sites for Cisco Unified Communications Release 6.0(1); this site, for IP telephony systems, and the site for [contact center systems](#). Use your Back button to return to this site.

## Cisco Unified Communications System Release Notes

[System Release Notes for IP Telephony: Cisco Unified Communications System, Release 6.0\(1\)](#)

# Using This Information System

This information system, the Cisco Information Access Manager (IAM), is designed to give you an easily navigable framework for accessing all documentation for your system, solution, or product. The following sections describe using the IAM:

- [About the IAM Window](#)
- [Types of Topics](#)
- [Comprehensive Index \(in Some IAMs\)](#)
- [Graphics with Hotspots and Popup Text \(Image Maps\)](#)
- [Where Information Is Located](#)
- [About the Secondary Browser Window](#)
- [Tips on Using the IAM](#)

**Note**

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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.

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## About the IAM Window

The IAM 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 an IAM window for a fictitious solution. View descriptions of numbered window elements in [Table 1-2](#).

Figure 1-1 Example of Information Access Manager Window

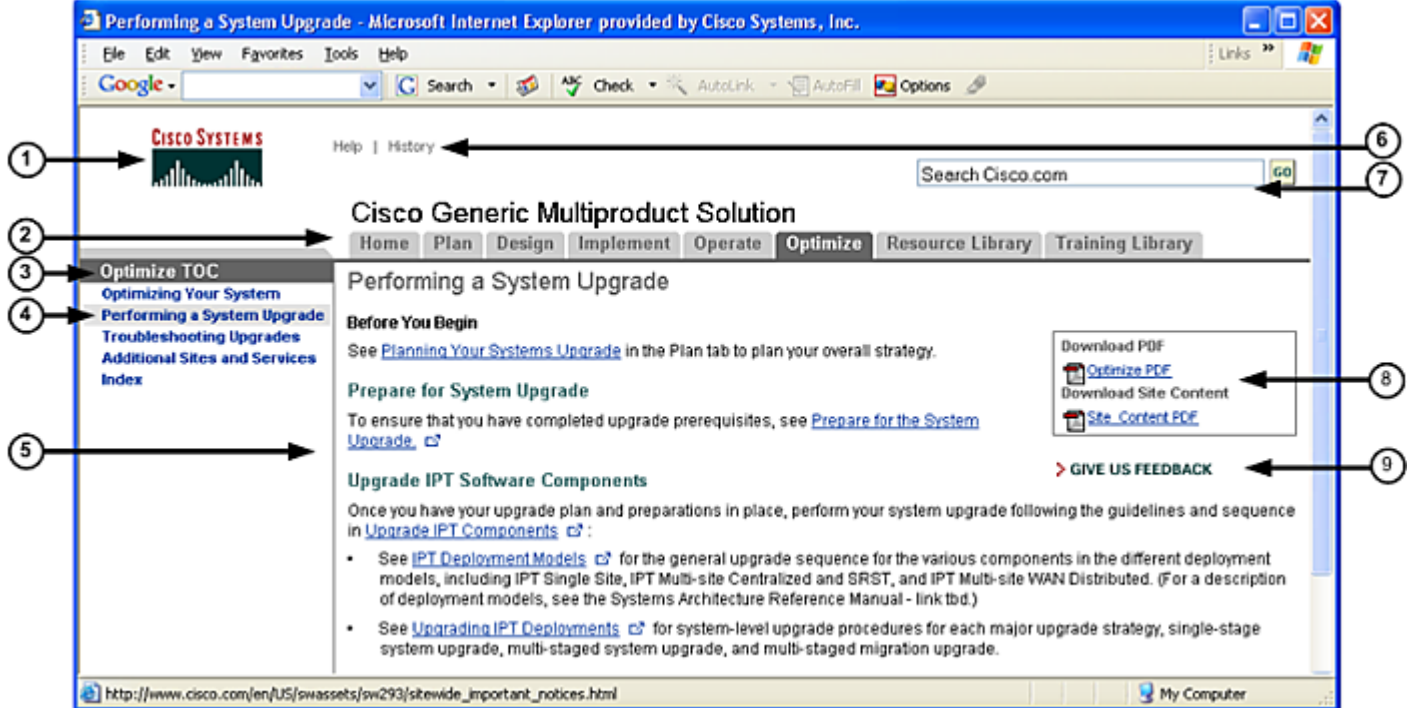



Table 1-2 Key to Window Illustration

1	Cisco logo. Click to go to Cisco Systems home page, replacing the IAM in the browser (the Back button takes you back to the IAM window).	6	Access-from-anywhere links to Help and History. (These links may have different labels, and in some cases may be used for different topics, such as a glossary.)
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. In the first content pane for a tab, you are shown an overview of what is on the tab and the tasks and concepts covered.	7	Search box: Use to search all of Cisco.com, not specifically this IAM. Search list appears in a new window so that you do not lose your place within the IAM.
3	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.  Some IAMs have an Index link at the bottom of every TOC. Click for an index of the entire IAM. Use this if you are not sure where to find a topic.	8	Download an Adobe Acrobat PDF of the content of the current tab or the content of the entire site.

**Table 1-2 Key to Window Illustration (continued)**

4	<p>Main heading in a TOC, such as "Performing a System Upgrade." If the heading is blue, it is a link that goes to a topic in the content pane. If it is black, it 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>	9	<p>GIVE US FEEDBACK: Click to go the Feedback form at the bottom of the page to provide page-specific feedback.</p> <p>Some sites may also have an email link for sending direct feedback by email.</p>
5	<p>Content pane, where the information resides.</p> <p>Note two kinds of links in the content pane:</p> <ul style="list-style-type: none"> <li>• A link to another topic in the content pane looks like an ordinary link. Clicking the link switches the contents of the pane.</li> <li>• 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.</li> </ul>		

## 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 "Installing the Cisco Unified CallManager," 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.”

## Comprehensive Index (in Some IAMs)

If you see an Index link at the bottom of a TOC, you can click it to view a hyperlinked index to all the topics in the IAM. Use this index if you are not sure where to find a topic that you are interested in.

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 in the IAM 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 IAM.
- Product and technology overviews, detailed requirements, task details, and other more generic topics are located outside the IAM. 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, [Installing the Cisco Unified CallManager](#) . This means that 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 main IAM flow.
- 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 [Installing the Cisco Unified CallManager](#)  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 Using the IAM

- Use tabs to navigate between major process areas.
- Use the TOC at the left of the IAM 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 choosing **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.
- (In some IAMs) Use the Index (click the link at the bottom of any TOC) if you are not sure where to find a topic that you are interested in.

# Market Descriptions

Cisco provides Unified Communications solutions for every market size. The following describes the small, medium, and enterprise markets:

- [Small Business](#)

Small businesses are those with the number of employees between 5 and 100. These types of businesses can be characterized by a need for systems that are low-cost, easy to deploy, easy to use, and scalable. These companies face the challenge of managing technology without taking the focus off business.

- [Medium Business](#)

Medium businesses are those with the number of employees between 100 and 1000. There are over 5,000,000 firms worldwide that are considered medium businesses. These businesses vary greatly when determining the voice, video and data requirements of running a business. The role of technology is changing for this size of business, in that these businesses are increasingly competing in a global economy and require network technology to better connect with customers, suppliers, and customers.

- [Enterprise Business](#)

Enterprise businesses are those with more than 1000 employees. The technology demands of an enterprise business requires a system of enterprise-class solutions that facilitates more engaging and efficient interactions among employees, partners, and customers, and provides the foundation for a collaborative workforce. They require applications that enable user-controlled productivity anywhere, anytime with any device and standards-based, secure systems, built into an intelligent, integrated network.

**Note**

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Many of the Cisco Unified Communications products and solutions can be applied in any market. Those products and solutions that apply to a specific market are labeled as such.

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## Using the Resource Library

The Resource Library tab is a single location for you to get related and additional information about Cisco Unified Communications. The Resource Library contains the following:

- System description PDF
- System release notes
- Network topology resources
- Links to component troubleshooting guides
- Links to component documentation
- Configuration files
- End-of-sale and end-of-life products
- System test results

## Using the Training Library

The Training Library tab is the location for all Cisco Unified Communications training materials for partners, customers, and employees. The Training Library contains the following:

- Videos on demand (VODs)
- Links to partner certification training programs
- Links to instructor-led courses

## Obtaining Documentation, Obtaining Support, and Security Guidelines

For information on obtaining documentation, obtaining support, providing documentation feedback, security guidelines, and also recommended aliases and general Cisco documents, 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>



## CHAPTER 2

# Prepare and Plan

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## Introduction to Prepare and Plan

In the Prepare and Plan 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. Then, create a business case for the IP telephony system that provides the best return on your investment.



**Tip**

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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.

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### Before You Begin

Understand the features and functions of IP telephony applications. Start with the [IP Telephony Overview](#) and the [System Release Notes](#). Then, review the deployment models to understand your options.

### When You Are Done

You have defined and created the following:

- Your business and system requirements
- A 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

- [Cisco Unified Communications Features and Benefits Overview](#)
- [Planning Concepts](#)
- [Planning Tasks](#)

## Cisco Unified Communications Features and Benefits Overview

The Cisco Unified Communications 6.0(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](#)
- [System Release Strategy](#)
- [Service Offerings](#)
- [Career Certifications](#)
- [Solution Bundling](#)
- [Intelligent Information Network](#)
- [Business Productivity Applications](#)
- [Customer Interaction Network](#)
- [IP Communications](#)
- [Security](#)
- [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.

This release of the Cisco Unified Communications system introduces the Cisco Unified Communications Manager, Business Edition and deployment models for the medium-sized business. The Cisco Unified Communications Manager, Business Edition includes the features and capabilities of Cisco Unified Communications Manager, Cisco Unified Mobility, and Cisco Unity Connection co-resident on a single, low-cost Media Convergence Server. The Cisco Unified Communications Manager, Business Edition is designed to support 150 to 500 endpoints in one main and up to five remote locations.

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 UC system.

## System Release Strategy

The Cisco Unified Communications system includes the following types of releases:

- Major release—Marks the beginning of a major new release version. This release type typically is based on a major release of at least one of these components: Cisco Unified Communications Manager, Cisco Unity, Cisco Unified MeetingPlace, or Cisco Customer Response Solutions.
- Minor release—Adds features and fixes to an existing major release. This release type can consist of revisions to existing components and new versions of components.
- Maintenance release—Contains bug fixes for one or more of the components. This release type is based on an existing major or minor release.

For example, in Cisco Unified Communications release 5.1(1), “5” indicated the major release, the first “1” indicated in the minor release, and the second “1” indicated the maintenance release.

## 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.

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.

New with this release of Cisco Unified Communications is the Cisco SMB Network Operate & Optimize Service. This 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 Voice Professional (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 CCVP certification can help create a telephony solution that is transparent, scalable, and manageable. Earning a CCVP 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.

This release of the Cisco Unified Communications system introduces a new bundling option for medium-sized businesses. This option includes the Cisco Unified Communications Manager, Business Edition, which is designed specifically to address the call processing and messaging needs of medium-sized businesses, as well as new network management tools.

## 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 using Cisco Unified Videoconferencing, and web conferencing capabilities enable a range of meeting applications, including highly-collaborative meetings, training sessions, and presentations.
- Messaging—Cisco Unity provides users with access to voice, e-mail, and fax messages from a Cisco Unified IP Phone or from a PC. These solutions combine unified messaging with personal productivity tools to help manage communications quickly and conveniently. For midsize organizations, Cisco Unified 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, messaging, and conferencing.
- Cisco Unified Presence—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), 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 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
  - 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 in the Cisco Unified Communications network as their 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 Phone 7920G. In addition, this release includes enhanced mobile IP phone applications that allow users to:
    - Dynamically managing 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 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.

## 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 (line side) 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 (Unified SRST) allows remote branch offices to remain in service even when the WAN access link is lost.

## IP Telephony Overview

The Cisco IP telephony system includes a wide array of hardware and software components, such as call processing products, communications endpoints (Unified IP phones and video devices), and special applications, all deployed over a converged network infrastructure. The network infrastructure for Cisco IP telephony includes PSTN gateways, analog phone support, and digital signal processor (DSP) farms.

The following topics are described:

- [Market Descriptions](#)
- [Product Categories](#)
- [IP Telephony Deployment Models](#)
- [System Features in This Release](#)

## Market Descriptions

Cisco provides Unified Communications solutions for every market size. The following subsections describe the small, medium, and enterprise markets and the Unified Communications solutions that Cisco offers:

- [Small Business](#)
- [Medium Business](#)
- [Enterprise Business](#)

**Note**

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Many of the Cisco Unified Communications products and solutions can be applied in any market. Those products and solutions that apply to a specific market are labeled as such.

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### Small Business

Small businesses are those with the number of employees between 5 and 100. These businesses require IP telephony systems that are low-cost, easy to deploy, easy to use, and scalable. These businesses must face the challenge of managing the technology around a data and voice communication systems without taking the focus off business.

Many growing businesses do not have the capital to keep up with the latest productivity-enhancing technologies, let alone the staff to maintain the systems. Until Cisco provided Unified Communications for small business, communications options had been limited to products and services that were too complicated, too costly, or not designed to work as a complete system. Now, Cisco delivers cost-effective voice, video, and data integration that is critical to the success of the small business.

The Cisco Unified Communications solution options for small business include:

- [Call Control](#)
  - Cisco Unified Communications Manager Express (formerly known as Cisco Unified CallManager Express)
  - Cisco Unified Communications 500 Series for Small Business (designed specifically for business with under 50 users)
  - Cisco Unified Survival Remote Site Telephony
- [Conferencing](#)
  - MeetingPlace Express
- [Voice Mail and Messaging](#)
  - Cisco Unity Express
- [Wireless and Mobility](#)
  - Cisco 500 Series Wireless Express Access Point and Controller
- [Network Management](#)
  - Cisco Monitor Manager and Cisco Monitor Director
- [Infrastructure](#)
  - Cisco Unified Communications 500 Series for Small Business, Cisco Unity Express, Cisco 800 Series routers,
  - Catalyst Express 500 Series Switches

## Medium Business

Medium businesses are those with the number of employees between 100 and 1000 employees. There are over 5,000,000 firms worldwide that are considered medium businesses. These businesses vary greatly when determining the voice, video and data requirements of running their business.

The role of technology is changing for medium businesses. As organizations and competitors become more global, they are turning to network technology to better connect with customers, suppliers, and customers.

Cisco Unified Communications is an integrated set of communications products and services that addresses the needs of medium businesses. It optimizes the resources of a business by transparently integrating voice, video, data, security, and mobility into a single efficient and affordable communications solution. Cisco Unified Communications works with existing business applications and infrastructure to create an accessible yet secure network in which information is always available. All communications are more effective, more mobile, and highly secure.

A Cisco Unified Communications solution resides on a single, converged voice, video and data network that delivers the highest level of security because security is built right into the network. An open platform provides superior investment protection, allows easy integration of critical applications from Cisco and other industry leaders, and includes more support for mobility, network management, and security.

The Cisco Unified Communications options for medium businesses include:

- **Call Control**
  - Cisco Unified Communications Manager 6.0, with popular key system-like features (intercom, hold reversion, message waiting indicator audio notification, and do not disturb (DND))
  - Cisco Unified Communications Manager Business Edition, available with Cisco Unity Connection co-resident on the same server
  - Cisco Unified Communications Manager Assistant
  - Cisco Unified Communications Manager Express
  - Cisco Unified Survivable Remote Site Telephony (SRST)
  - Cisco Unified Presence
  - Cisco Unified Business Attendant Console and Cisco Unified Department Attendant Console
- **Applications**
  - Cisco Emergency Responder
  - Cisco Unified Application Environment
- **Conferencing**
  - Cisco Unified MeetingPlace Express
  - Cisco Unified Video Conferencing
- **Voice Mail and Messaging**
  - Cisco Unity Connection
- **Endpoints and Clients**
  - Cisco Unified Personal Communicator
  - Cisco Unified Video Advantage
  - Cisco IP Communicator

- Cisco Unified IP Phone 79XX series
- **Wireless and Mobility**
  - Aironet Wireless Access Point
- **Security**
  - Cisco Advanced Security Appliance ASA 5500 Series
  - Firewall Service Modules (FWSM)
  - Cisco Intrusion Prevention System Appliance IPS-4200
  - Cisco Security Agent Management Center
  - Cisco Security Monitoring, Analysis, and Response System (MARS)
  - Cisco Clean Access
- **Network Management**
  - Cisco Unified Operations Manager
  - Cisco netManager Unified Communications
  - Cisco Monitor Manager and Cisco Monitor Director
- **Infrastructure**
  - Routers
  - Gateways and Gatekeepers (H.323/MGCP)
  - Cisco Resource Reservation Protocol (RSVP)
  - Cisco Unified Mobility (formerly known as Cisco Unified MobilityManager) now integrated into the Cisco Unified Communications Manager software

## Enterprise Business

Enterprise businesses are those with the number of employees exceeding 1000 employees. The technology demands of large businesses require a system of enterprise-class solutions that facilitate more engaging and efficient interactions among employees, partners, and customers, and provide the foundation for a collaborative workforce. They require applications that enable user-controlled productivity anywhere, anytime with any device and standards-based, secure systems, built into an intelligent, integrated network.

Cisco Unified Communications solutions dramatically improve operational efficiencies, increase organizational productivity, and enhance customer satisfaction to create an empowered, effective work environment. By promoting greater levels of workforce collaboration, Cisco Unified Communications solutions help enterprises exceed customer expectations, outpace the competition, and realize a measurable return on their investments. These solutions and technologies are key to delivering enterprise-class IP Communications.

The Cisco Unified Communications options for enterprise businesses include:

- **Call Control**
  - Cisco Unified Communications Manager 6.0, with popular key system-like features (intercom, hold reversion, message waiting indicator audio notification, and do not disturb (DND))
  - Cisco Unified Communications Manager Assistant
  - Cisco Unified Communications Manager Express
  - Cisco Unified Survivable Remote Site Telephony (SRST)

- Cisco Unified Presence
  - Cisco Unified Contact Center Express/Cisco Customer Response Solution
  - Q Signaling (QSIG)
- [Applications](#)
  - Cisco Emergency Responder
  - Cisco Unified Application Environment
- [Conferencing](#)
  - Cisco Unified MeetingPlace
  - Cisco Unified Video Conferencing
  - Cisco Unified MeetingPlace for TelePresence
- [Voice Mail and Messaging](#)
  - Cisco Unity
  - Cisco Unity Express
  - Microsoft Active Directory (integrated with Cisco Unity and Cisco Customer Response Solution)
- [Endpoints and Clients](#)
  - Cisco Unified Personal Communicator
  - Cisco Unified Video Advantage
  - Cisco IP Communicator
  - Cisco Unified IP Phone 79XX series
- [Wireless and Mobility](#)
  - Aironet Wireless Access Point
  - Cisco Unified Mobility (formerly known as Cisco Unified MobilityManager) now integrated into the Cisco Unified Communications Manager software
- [Security](#)
  - Cisco Advanced Security Appliance ASA 5500 Series
  - Firewall Service Modules (FWSM)
  - Cisco Intrusion Prevention System Appliance IPS-4200
  - Cisco Security Agent Management Center
  - Cisco Security Monitoring, Analysis, and Response System (MARS)
  - Cisco Clean Access
- [Network Management](#)
  - Cisco Unified Operations Manager
  - Cisco Monitor Manager and Cisco Monitor Director
  - Cisco Unified Service Monitor
  - Cisco Unified Provisioning Manager
  - Cisco Unified Service Statistics Monitor
- [Infrastructure](#)

- Routers
- Gateways and Gatekeepers (H.323/MGCP)
- Cisco Resource Reservation Protocol (RSVP)

## Product Categories

The primary types of IP telephony system components are grouped in the following categories:

- Call control—Cisco Unified Communications Manager is the core call processing software for the Cisco IP telephony system. It builds call processing capabilities on top of the Cisco IP network infrastructure. It extends enterprise telephony features and capabilities to packet telephony network devices such as Unified IP phones, media processing devices, Voice over IP (VoIP) gateways, and multimedia applications. Applications—Cisco Unified Application Environment is the core software component that enables the development of customized applications that streamline business processes and drive productivity through IP-based Unified Communications.
- Conferencing—Cisco Unified MeetingPlace is the core conferencing software that provides integrated voice, video, and Web conferencing capabilities to enable remote meetings that are natural and effective with face-to-face quality, such as meetings, training sessions, and presentations.
- Voice mail and messaging—Cisco Unity is the core messaging software that delivers powerful voice, integrated, and unified messaging options that transparently integrate with Microsoft Exchange, Lotus Domino, and Novell GroupWise.
- Endpoints and clients—Cisco IP Communicator is the core software that integrates the management capabilities of IP-based networks with phones, pagers, and computers and use these for signaling, voice communications, and data communications.
- Wireless and Mobility—Cisco Unified Mobility Advantage, Cisco Unified Mobile Communicator, and Aironet Wireless Access Points are the core software and hardware components that enable secure and scalable methods to real-time access to instant messaging, e-mail, and network resources.
- Security—Cisco Advanced Services Appliance ASA 5500 Series, Firewall Services Modules, and Cisco Intrusion Prevention System Appliance IPS-4200 are the core hardware and software components that process new threats to the network by using proactive, automated, real-time threat management.
- Network management—Cisco Unified Operations Manager is the core software component that provides an integrated view of the entire Cisco Unified Communications system and presents the current operational status of each component of the IP communications network.
- Infrastructure—Cisco routers, voice gateways, and Cisco Unified Telepresence Multipoint Switches are the core hardware components that provide reliable connectivity that is more resilient and enables all the latest network services.

## IP Telephony Deployment Models

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

**Table 2-1**      **Deployment Models**

<b>Deployment Model</b>	<b>Description</b>
<a href="#">Single Site with Cisco Unified Communications Manager Business Edition Model</a>	This model is designed for medium-sized, stand-alone businesses in which most or all employees are IPC users. This model supports up to 500 users.
<a href="#">Multisite with Cisco Unified Communications Manager Business Edition Model</a>	This model is designed for medium-sized businesses with multiple locations in which most or all employees are IPC users and can support up to 500 users across 5 locations.
<a href="#">Medium Single-Site Model</a>	This model is designed for medium-size autonomous offices in which most or all employees are IPC users and can support up to 1,000 users.
<a href="#">Large Single-Site Model</a>	This model is designed for large autonomous offices in which most or all employees are IPC users and can support up to 20,000 users, some of whom will use legacy phones connected to legacy PBX systems.
<a href="#">Headquarters with Branches Centralized Model</a>	This model is designed for distributed operations with a large central, or headquarters, site and multiple remote, or branch, sites and can support up to three large sites with up to 20,000 users in each and approximately 1,500 branch sites with up to 1,000 users in each site.
<a href="#">Headquarters with Branches Distributed Model</a>	This model is designed for distributed operations with a large central, or headquarters, site and multiple remote, or branch, sites and can support up to three headquarters sites with up to 20,000 users in each site and up to 1,500 branch sites with up to 240 users in each site.
<a href="#">Small Multisite Distributed Model</a>	This model is designed for multiple small to medium-size autonomous locations that are connected to each other through a WAN with provisioning and configuration information the same in each site and not all employees are IPC users. It can support approximately 2,500 interconnected small sites with up to 250 users in each site.
<a href="#">Large Multisite Distributed Model</a>	This model is designed for national or international organizations with multiple large sites (such as campuses or factories) that are connected to each other through a WAN and can support approximately up to 10 interconnected large sites.

See also [Deployment Methodology](#) in the Cisco Unified Communications System Description.

## System Features in This Release

The Cisco IP telephony system is part of the end-to-end system release for Cisco Unified Communications that integrates telephony, conferencing, messaging, and security products for IP customers who have a variety of deployment models. For detailed Cisco IP telephony feature information, see the [System Release Notes for IP Telephony: Cisco Unified Communications System, Release 6.0\(1\)](#).

### Additional Product Information

- [Cisco Unified IP Telephony Solution](#)

## 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](#). You should also review the information contained in the [Market Descriptions](#) topic.

The primary planning considerations that drive the planning stage are: types of deployment, whether it will be a new installation or migration to new installation with existing equipment; 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**

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

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The concepts that you should review are as follows:

- [Deployment Types](#)
- [Cost of Ownership](#)
- [Redundancy](#)
- [Capacity and QoS](#)
- [Security](#)

## 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 an 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 for IP Telephony: 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 SAFE Blueprint at [www.cisco.com/go/safe](http://www.cisco.com/go/safe). For more details about Cisco integrated network security solutions, see the following resources:

- [www.cisco.com/en/US/products/hw/vpndevc/](http://www.cisco.com/en/US/products/hw/vpndevc/)
- [www.cisco.com/go/secureuc](http://www.cisco.com/go/secureuc)
- [www.cisco.com/go/netpro](http://www.cisco.com/go/netpro)

## 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](#)
- [Review Release Matrix](#)
- [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

Two important factors that drive your business requirements are:

- Size of your business, see [Market Descriptions](#)
- Requirements for installation and upgrade, see:
  - [Plan and Prepare for Your System Installation](#)
  - [Plan and Prepare for Your System Upgrade](#)
  - [Install and Configure System Components](#)
  - [Performing a System Upgrade](#)
  - [Additional Sites and Services](#)

Review [Step 1: Determine Your Requirements](#) of the Deployment Methodology chapter in the Cisco Unified Communications System Description.

## 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.

## Use Planning Tools and Templates

This topic includes planning tools and links to documents that provide guidelines for designing and configuring your IPT 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 network solutions. The following SRNDs are recommended for designing Cisco Unified Communications systems:

- [Cisco Unified Communications SRND Based on Cisco Unified Communications Manager 6.x](#)
- [Cisco Unified Communications SRND Based on Cisco Unified CallManager 5.x](#)
- [Cisco Unified Communications SRND Based on Cisco Unified CallManager 4.x](#)
- [Cisco Unified Communications Manager Express Solution Reference Network Design](#)
- [Cisco Unified Contact Center Express Solution Reference Network Design](#)
- [Enterprise QoS SRND, Version 3.3, November 2005](#) (right-click to download PDF)



**Note**

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

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### Solution Expert Tool

Solution Expert is a web-based tool that assists in the design, configuration, quoting, and ordering of 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. To access Solution Expert, go to the following URL. For an overview of how to use the tool, see the introductory PDF on the home page.

<http://www.cisco.com/go/sx>

### Quote Builder Tool

The Quote Builder tool is a solutions quoting application for Cisco Unified Communications products. Quote Builder is available to specialized partners and Cisco employees. With Quote Builder, users can build a system quote with design documents to aid in the implementation of the solution. Quote Builder also validates designs for common deployments. Quote Builder generates a bill of materials, a network diagram, and design guides for deployment. To access Quote Builder, go to the following URL:

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

## Ordering Guides

Ordering guides for most Cisco Unified Communications products are available for partners and Cisco employees. For information on ordering guides, go to the following URL:

[http://www.cisco.com/web/partners/sell/technology/ipc/announcements/unified\\_communications\\_system\\_6\\_launch.html](http://www.cisco.com/web/partners/sell/technology/ipc/announcements/unified_communications_system_6_launch.html)

Click the “What is available for Partners” tab to view a list of the ordering guides and other marketing collaterals.

## Understand Your Deployment Options

Review the [Deployment Models](#) chapter in the Cisco Unified Communications System Description for a guide to site models and see [Table 2-1](#) for a brief overview of each model.

## Identify System Components

For a brief description of all the components that are available with Cisco Unified Communications System Test Release 6.0(1), refer to the [Component Overviews](#) chapter in the Cisco Unified Communications System Description.

See the [Install and Configure System Components](#) topics in the Implement tab for links to information that describe components that are specific to the IPT system.

## Review Release Matrix

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.

## Collect and Analyze Data

Using available tools, system designers collect data on the network to assess network readiness.

Tasks for data collection and analysis include:

- Perform an infrastructure analysis—By obtaining floor plans and campus maps, including utilities and conduit systems, deficiencies in infrastructure can be identified.
- Perform a software gap analysis—Do a software gap analysis to address network management tools for the IP network.
- Perform 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.

## Plan and Prepare for Your System Installation

This topic provides the system-level information required to install IPT components in Cisco Unified Communications System Release 6.0(1).

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

### Planning Your System Installation

This topic provides links to documentation for you to review before installation and includes types of installations and components that are included in the release sets, and describes installation strategies. See the following sections:

- [Scope of this Installation Documentation](#)
- [System Installation Overview](#)
- [Component 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, see [Performing Your System Installation](#) on the Implement tab.

### Preparing for Your System Installation

This topic provides links to documentation for you to review before you install the Cisco Unified Communications System. It describes preinstallation tasks and the initial installation sequence. It also lists the components in the release set and provides information regarding the deployment of various components. See the following sections:

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

When your installation plans are complete and you are ready to install components, go to [Performing Your Installation](#).

## Plan and Prepare for Your System Upgrade

This topic provides links to documentation for you to review the system-level information required to upgrade IPT components from previous Unified Communications releases to Release 6.0(1).

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

## Planning Your System Upgrade

This topic provides an overview of the upgrade process for IPT 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 available based on the software deployed in your specific environment. For more information, see [System Upgrade Paths](#).

This topic contains the following sections:

- [Release Sets](#)
- [Upgrade Roadmap](#)
- [Upgrade Overview](#)
- [System Upgrade Paths](#)
- [System Upgrade Strategies](#)

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


## Preparing for Your System Upgrade

This topic discusses information to review before the actual upgrade process, such as the general upgrade approach for the different IPT components, upgrade release versions of components involved in the upgrade, and release version compatibility. 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 a 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 Unified Communications Services](#) site.

## Cisco Unified Communications System Demos

The Cisco Unified Communications system demonstration describes the various methods available for use by Cisco sales teams to demonstrate the Cisco Unified Communications system.

[Cisco Unified Communications System Demonstration Programs](#) [Internal]





# CHAPTER 3

## Design

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### 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 for 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.

For specific deployment steps, see [Deployment Methodology](#) in the Cisco Unified Communications System Description.



#### Tip

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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.

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#### Before You Begin

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

- Business and system requirements
- Service-level agreements
- 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:

- Network diagrams (see [Network Topology Resources](#) on the Resource Library tab 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

Go directly to the main design concepts and tasks:

- [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 6.x](#)
- [Cisco Unified Communications SRND Based on Cisco Unified CallManager 5.x](#)
- [Cisco Unified Communications SRND Based on Cisco Unified CallManager 4.x](#)
- [Cisco Unified CallManager Express Solution Reference Network Design](#)
- [Cisco Unified Contact Center Express Solution Reference Network Design](#)

**Note**

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

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## Using Design Tools and Templates

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

- Cisco CallManager Capacity Tool  
<http://www.cisco.com/cgi-bin/CT/CCMCT/ct.cgi>

The Cisco CallManager Capacity Tool calculates the minimum number of active subscribers that are required to support a given installation. The inputs consist primarily of quantity and usage information on the various device types that are supported in a Cisco Unified Communications Manager system.

- IPC Tools

<http://tools.cisco.com/partner/ipccal/index.htm> 

The IPC Tools, such as the IPC Resource Calculators, are intended to simplify and automate the process of sizing IP resources that are required for specific business operations. They are also useful for verifying and troubleshooting existing installations.

The output from these tools can also be used as input to the contact center Express Configuration Tool and the Cisco CallManager Capacity Tool.

- Solution Expert tool

<http://www.cisco.com/go/sx> 

Solution Expert is a web-based tool that assists in the design, configuration, quoting, and ordering of 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.

- Quote Builder Tool

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

The Quote Builder tool is a solutions quoting application for Cisco Unified Communications products. Quote Builder is available to specialized partners and Cisco employees.

With Quote Builder, users can build a system quote with design documents to aid in the implementation of the solution. Quote Builder also validates designs for common deployments. Quote Builder generates a bill of materials, a network diagram, and design guides for deployment.

## Design Tasks

This topic contains an overview of the design tasks for the following systems:

- [Small Business Systems](#)
- [Medium Business Systems](#)
- [Enterprise Systems](#)

## Small Business Systems

The following list is an overview of tasks for small business systems and is not meant to represent an ordered sequence of tasks.

- [Identify the Components That You Need](#)
- [Review Tested Site Models](#)
- [Review System Caveats](#)

- [Review System Test Results](#)
- [Develop Traffic Engineering Specifications](#)
- [Define Security Policies](#)

## Medium Business Systems

The following list is an overview of tasks for medium business systems and is not meant to represent an ordered sequence of tasks.

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

## Enterprise Systems

The following list is an overview of tasks for designing enterprise systems and is not meant to represent an ordered sequence of tasks.

- [Identify the Components That You Need](#)
- [Review Tested Site Models](#)
- [Review System Caveats](#)
- [Review System Test Results](#)
- [Develop Traffic Engineering Specifications](#)
- [Define Security Policies](#)
- [Design for High Availability](#)

## Identify the Components That You Need

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

- [IP Telephony Overview](#)—Describes the primary Cisco software components in IPT systems.
- [Review Release Matrix](#)—Identifies the components and their software versions that you need.
- [Component Resources](#)—Lists the component documentation.
- [Cisco Unified Communications Compatibility Tool](#)—Provides tables that identify the compatible software release versions for each product in each Cisco Unified Communications release.
- [Cisco Interoperability Portal](#)—Provides information about configuring Cisco technologies with third-party products and lists features that interoperate between Cisco solutions and other vendors.

For an additional overview of primary components that can be installed and configured in the IPT environment, see [Component Installation and Upgrade](#) and [Component Reference Configurations](#) in the Implement tab.

## Ordering Tools

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

<http://www.cisco.com/go/sx> 

- The Quote Builder tool is a solutions quoting application for Cisco Unified Communications products. Quote Builder is available to specialized partners and Cisco employees. With Quote Builder, users can build a system quote with design documents to aid in the implementation of the solution. Quote Builder also validates designs for common deployments. Quote Builder generates a bill of materials, a network diagram, and design guides for deployment. To access the Quote Builder tool, go to the following URL:

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

## Review Tested Site Models

For Release 6.0(1), Cisco developed a variety of site models as standard architectures. These models were tested and optimized for maximum efficiency and performance. You can derive your network design by choosing the deployment model that most closely matches your business and then adding the specific features and applications that meet your business needs. Review the following information:

- [Tested Deployments and Site Models](#)
- [Purpose of Solution Tests](#)
- [Multisite Distributed Deployment Options](#)
- [North America Site Models](#)
- [Europe and Emerging Markets Site Models](#)

## Review System Caveats

System caveats are system limitations and restrictions. Check the latest release notes to make sure that your design has taken all system caveats into consideration. System caveats are listed under the [Limitations and Restrictions](#) section of the release notes.

## 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 Cisco Unified Communications Release 6.0(1), see [System Test Results](#) in the Resource Library.

## Develop Traffic Engineering Specifications

For background information on various traffic analysis concepts and features that are applicable to Voice over IP (VoIP), see [Traffic Analysis for Voice over IP](#). 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.

Use the [Cisco CallManager Capacity Tool](#)  to calculate the minimum number of active subscribers that are required to support a given installation. Inputs consist primarily of quantity and usage information on the various device types that are supported in a Cisco Unified Communications Manager system.

The following third-party traffic engineering tools are provided for your reference:

- [VoIP Bandwidth Calculator](#)
- [Online Erlang Traffic Calculators](#)

## Define Security Policies

Refer to security policies in these guides:

- [Cisco Unified CallManager Security Guide, Release 6.0\(1\)](#)
- [Cisco Unified CallManager Security Guide, Release 5.0\(4\)](#)

Additional IP security information is included here for your reference:

- [Enhanced Security for Unified Communications](#)
- [Integrated network security—SAFE Blueprint](#)
- [Expanding the Self-Defending Network](#)
- [Design Zone for Security](#)
- [Cisco Security Center](#)

## Design for High Availability

Cisco IP telephony systems are designed for high availability. In order to achieve this, the design must include redundancy for failover and rapid recovery. For recommendations and design assistance from Cisco Advanced Services, see [Navigating the Road to Five Nines](#).

The Unified Communications Manager plays the key role in maintaining call processing following a failure in an IP telephony environment. This topic describes the following high-availability features that are built into Unified Communications Manager:

- [Unified Communications Manager Clusters](#)
- [Unified Communications Manager Redundancy Groups](#)
- [Keepalive Mechanism](#)

**Note**

The information in this topic applies to multiple Unified Communications Manager server clusters in a large enterprise environment and does not apply to Cisco Unified Communications Manager Business Edition. Cisco Unified Communications Manager Business Edition is a single-server solution designed for medium businesses up to a maximum of 500 employees and does not offer redundancy.

## Unified Communications Manager Clusters

A cluster comprises a set of Unified Communications Manager servers (or *nodes*) that share the same database and resources. Unified Communications Manager servers can be configured to perform the following functions: database server, TFTP server, or application software server. You can dedicate a particular server to one function or combine several functions on one server, depending on the size of your network and the level of redundancy desired.

Each cluster can have only one database server (also called the *first node*) and usually one TFTP server (either separate or combined with another function). Cisco Systems recommends that large enterprise networks contain a dedicated Unified Communications Manager database server with other servers (called *subsequent nodes*) running the Unified Communications Manager application software. The Unified Communications Manager application software performs all call control, including signaling of endpoints, feature invocation, and calling restrictions. Large-scale networks typically use paired redundant application software servers, running in an active-active configuration, with endpoints evenly distributed across the two servers. The TFTP server provides configuration files for the endpoint devices and the associated firmware loads. Large enterprise networks typically use redundant TFTP servers.

## Unified Communications Manager Redundancy Groups


A redundancy group comprises a prioritized list of up to three Unified Communications Manager servers. You can associate each group with one or more device pools to provide call processing redundancy. Each group must contain a primary Unified Communications Manager, and it may contain one or two backup Unified Communications Manager servers. If the primary Unified Communications Manager fails for any reason, the first backup Unified Communications Manager in the group takes control of the devices that were registered with the primary Unified Communications Manager. If you specify a second backup Unified Communications Manager for the group, it takes control of the devices if both the primary and the first backup Unified Communications Manager servers fail.

When a failed primary Unified Communications Manager comes back into service, it takes control of the group again, and the devices in that group automatically reregister with the primary Unified Communications Manager.

## Keepalive Mechanism

A keepalive mechanism is an essential part of an IP telephony solution. Keepalives ensure that endpoints (typically phones and gateways) retain their communications path to a Unified Communications Manager server. Keepalives not only determine when the primary Unified Communications Manager server is no longer available, they also determine when the site has become completely isolated from a centralized call control system and must revert to some form of remote survivability capability such as Cisco Unified SRST. Keepalives avoid delays in establishing a call caused by searching for an available Unified Communications Manager server.

## 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 Unified 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 4

# Implement

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## 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. To minimize downtime, an essential component of this process is the implementation plan.



**Tip**

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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.

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### Before You Begin

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

Before you begin installing components, 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 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 implemented
- 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 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 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. To access Solution Expert, go to the following URL. For an overview of how to use the tool, see the introductory PDF on the home page.

<http://www.cisco.com/go/sx> 

### Quote Builder Tool


The Quote Builder tool is a solutions quoting application for Cisco Unified Communications products. Quote Builder is available to specialized partners and Cisco employees.

With Quote Builder, users can build a system quote with design documents to aid in the implementation of the solution. Quote Builder also validates designs for common deployments. Quote Builder generates a bill of materials, a network diagram, and design guides for deployment. To access Quote Builder, go to the following URL:

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

### Ordering Guides

Ordering guides for most Cisco Unified Communications products are available for partners and Cisco employees. For information on ordering guides, go to the following URL:

[http://www.cisco.com/web/partners/sell/technology/ipc/announcements/unified\\_communications\\_system\\_6\\_launch.html](http://www.cisco.com/web/partners/sell/technology/ipc/announcements/unified_communications_system_6_launch.html) 

Click the “What is available for Partners” tab to view a list of the ordering guides and other marketing collaterals.

# Install and Configure System Components

When implementing a Cisco Unified Communications system, create a site-specific plan for your team. Describe what needs to be installed and configured. Your plan should list the referenced product-specific installation guides in [Table 4-1](#). [Table 4-2](#) contains products that were tested in this release and listed by technology with examples and links to configuration documents.

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.

[Preparing for Your System Installation](#) provides guidance for the installation order of components for a Cisco Unified Communications System, Release 6.0(1) IPT deployment. It does not describe installation procedures for individual components. For links to the complete documentation set for each IPT system component, see the [Component Resources](#) topic on the Resource Library tab.

## Performing Your System Installation

### Before You Begin

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

## Install IPT 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 deployment models. For a description of deployment models, see [Tested Deployments and Site Models](#).
- See [Installing Components](#) for more detailed installation information for each major installation strategy: single-stage and multistage system installation.
- See [Related Documentation](#) for links to component installation and upgrade documentation.

## Component Installation and Upgrade

Using the steps from the documents listed in [Table 4-1](#), install or upgrade the required components for your network in the recommended order according to your site-specific implementation plan.

Table 4-1 Component Installation Documentation

Product Category	Product Technology	Documentation Title
Call Control Components	Cisco Unified Communications Manager	<ul style="list-style-type: none"> <li>Installing Cisco Unified Communications Manager</li> <li>Upgrading to Cisco Unified Communications Manager Release 6.0(1) from Cisco Unified CallManager 4.x Releases</li> </ul>
	Cisco Unified Communications Manager Assistant	<ul style="list-style-type: none"> <li>Cisco Unified Communications Manager Assistant for Unified Communications Manager (CallManager)</li> <li>Quick Reference Guide for Cisco Unified Communications Manager Assistant</li> </ul>
	Cisco Unified Communications Manager Business Edition	<ul style="list-style-type: none"> <li>Installing Cisco Unified Communications Manager Release 6.0(1) for Cisco Unified Communications Manager Business Edition</li> </ul>
	Cisco Unified Communications 500 Series for Small Business	<ul style="list-style-type: none"> <li>Getting Started Guide for Cisco Unified Communications 500 Series</li> </ul>
	Cisco Unified Communications Manager Express	<ul style="list-style-type: none"> <li>Cisco Unified Communications Manager Express System Administrator Guide: <ul style="list-style-type: none"> <li>Installing and Upgrading Cisco Unified CME Software</li> </ul> </li> </ul>
	Cisco Unified Presence	<ul style="list-style-type: none"> <li>Installing Cisco Unified Presence Release 6.0(1)</li> </ul>
	Cisco Unified Survivable Remote Site Telephony (SRST)	<ul style="list-style-type: none"> <li>Cisco Unified SRST 4.0 System Administrator Guide: <ul style="list-style-type: none"> <li>Setting Up the Network</li> <li>Setting Up Cisco Unified IP Phones</li> <li>Setting Up Call Handling</li> <li>Configuring Additional Call Features</li> <li>Setting Up Secure SRST</li> <li>Appendix A: Preparing SRST Support for SIP</li> </ul> </li> <li>Cisco Unified Survivable Remote Site Telephony Version 4.1 (Data Sheet)</li> </ul>
	Cisco Unified Contact Center Express\Cisco Customer Response Solutions	<ul style="list-style-type: none"> <li>Cisco Customer Response Solutions Installation Guide</li> <li>Getting Started with Cisco Unified Contact Center Express</li> </ul>

**Table 4-1** *Component Installation Documentation (continued)*

<b>Product Category</b>	<b>Product Technology</b>	<b>Documentation Title</b>
<b>Application Components</b>	Cisco Emergency Responder	<ul style="list-style-type: none"> <li>• <a href="#">Cisco Emergency Responder Administration Guide 2.0, Installing Cisco Emergency Responder 2.0</a></li> </ul>
	Cisco Unified Application Environment	<ul style="list-style-type: none"> <li>• <a href="#">Installation Guide for the Cisco Unified Application Environment (2.4)</a></li> <li>• <a href="#">Upgrade Guide for the Cisco Unified Application Environment (2.4)</a></li> </ul>
	Cisco Fax Server	<ul style="list-style-type: none"> <li>• <a href="#">Cisco Fax Server Installation Guide</a></li> <li>• <a href="#">Installation Guide Supplement for Cisco Fax Server</a></li> </ul>
	Cisco Unified PhoneProxy	<ul style="list-style-type: none"> <li>• <a href="#">Cisco Unified PhoneProxy Installation and Quick Start Guide</a></li> </ul>

Table 4-1 Component Installation Documentation (continued)

Product Category	Product Technology	Documentation Title
Conferencing Components	Cisco Unified MeetingPlace	<ul style="list-style-type: none"> <li>• <a href="#">System Requirements for Cisco Unified MeetingPlace Release 6.0</a></li> <li>• <a href="#">Installation Planning Guide for Cisco Unified MeetingPlace Release 6.x</a></li> <li>• <a href="#">Installation and Upgrade Guide for Cisco Unified MeetingPlace Web Conferencing Release 6.x</a></li> <li>• <a href="#">Installation and Upgrade Guide for Cisco Unified MeetingPlace Audio Server Release 6.x</a></li> <li>• <a href="#">Installing Cisco Unified MeetingPlace H.323/SIP IP Gateway Software</a></li> <li>• <a href="#">Installing Cisco Unified MeetingPlace Directory Services Release 5.4</a></li> <li>• <a href="#">Installing Cisco Unified MeetingPlace Video Integration</a></li> <li>• <a href="#">Installing Cisco Unified MeetingPlace for Outlook</a></li> <li>• <a href="#">Installation and Administration Guide for Cisco Unified MeetingPlace for Jabber Release 6.x</a></li> <li>• <a href="#">Installation and Administration Guide for Cisco Unified MeetingPlace for Microsoft Office Communicator Release 6.x</a></li> </ul>
	Cisco Unified MeetingPlace Express	<ul style="list-style-type: none"> <li>• <a href="#">Installation and Upgrade Guide for Cisco Unified MeetingPlace Express Release 2.0</a></li> </ul>
	Cisco Unified Conferencing for Telepresence	<ul style="list-style-type: none"> <li>• <a href="#">Installation Guide for Cisco Unified Conferencing for TelePresence Version 1.1</a></li> <li>• <a href="#">Microsoft Outlook Integrated with Cisco Unified Conferencing for TelePresence Version 1.1</a></li> </ul>
	Cisco Unified Videoconferencing	<ul style="list-style-type: none"> <li>• <a href="#">Installation and Upgrade Guide for Cisco Unified Videoconferencing 3545 MCU Release 5.1</a></li> <li>• <a href="#">Installation and Upgrade Guide for Cisco Unified Videoconferencing 3515 MCU12 and MCU24 Release 5.1</a></li> </ul>

Table 4-1 Component Installation Documentation (continued)

Product Category	Product Technology	Documentation Title
Voice Mail and Messaging Components	Cisco Unity	<ul style="list-style-type: none"> <li>• <a href="#">Supported Hardware and Software, and Support Policies for Cisco Unity Release 5.x</a></li> <li>• <a href="#">Use the Installation Guide That Matches the Cisco Unity 5.x Configuration</a></li> <li>• <a href="#">Installation Guide for Cisco Unity Release 5.x in a Unified Messaging Configuration with Microsoft Exchange (With Failover Configured)</a></li> <li>• <a href="#">Installation Guide for Cisco Unity Release 5.x in a Unified Messaging Configuration with Microsoft Exchange (Without Failover)</a></li> <li>• <a href="#">Installation Guide for Cisco Unity Release 5.x in a Voice Messaging Configuration with Microsoft Exchange (With Failover Configured)</a></li> <li>• <a href="#">Installation Guide for Cisco Unity Release 5.x in a Voice Messaging Configuration with Microsoft Exchange (Without Failover)</a></li> <li>• <a href="#">Installation Guide for Cisco Unity Release 5.x with IBM Lotus Domino (With Failover Configured)</a></li> <li>• <a href="#">Installation Guide for Cisco Unity Release 5.x with IBM Lotus Domino (Without Failover)</a></li> <li>• <a href="#">Reconfiguration and Upgrade Guide for Cisco Unity Release 5.x (With IBM Lotus Domino)</a></li> <li>• <a href="#">Reconfiguration and Upgrade Guide for Cisco Unity Release 5.x (With Microsoft Exchange)</a></li> </ul>
	Cisco Unity Connection	<ul style="list-style-type: none"> <li>• <a href="#">Installation Guide for Cisco Unity Connection Release 2.x</a></li> <li>• <a href="#">Supported Hardware and Software, and Support Policies for Cisco Unity Connection 2.x</a></li> <li>• <a href="#">System Requirements for Cisco Unity Connection/ System Requirements for Cisco Unity Connection in Cisco Unified CMBE</a></li> <li>• <a href="#">System Requirements for Cisco Unity Connection Release 2.0</a></li> </ul>
	Cisco Unity Express	<ul style="list-style-type: none"> <li>• <a href="#">Cisco Unity Express 3.0 Installation and Upgrade Guide</a></li> </ul>

Table 4-1 Component Installation Documentation (continued)

Product Category	Product Technology	Documentation Title
<b>Endpoints and Clients Components</b>	Cisco Unified 79xx IP Phones	<ul style="list-style-type: none"> <li>• <a href="#">Cisco Unified 7900 Series IP Phones</a></li> </ul>
	Cisco IP Communicator	<ul style="list-style-type: none"> <li>• <a href="#">Cisco IP Communicator, Data Sheet</a></li> <li>• <a href="#">Deploying and Updating Cisco IP Communicator</a></li> </ul>
	Cisco Unified Personal Communicator	<ul style="list-style-type: none"> <li>• <a href="#">Installation Guide for Cisco Unified Personal Communicator, Release 1.2</a></li> </ul>
	Cisco Unified Video Advantage	<ul style="list-style-type: none"> <li>• <a href="#">Installation and Troubleshooting Guide for Cisco Unified Video Advantage Release 2.0</a></li> </ul>
<b>Wireless and Mobility Components</b>	Cisco Unified Mobile Communicator	<ul style="list-style-type: none"> <li>• <a href="#">Cisco Unified Mobile Communicator Product Literature Index</a></li> </ul>
	Cisco Unified Mobility Advantage	<ul style="list-style-type: none"> <li>• <a href="#">Cisco Unified Mobility Advantage Installation Guide</a></li> </ul>
	Aironet Wireless Access Points	<ul style="list-style-type: none"> <li>• <a href="#">Cisco Unified Wireless Products and Solutions</a></li> </ul>
<b>Security Components</b>	Cisco Advanced Security Appliance (ASA) 5500 Series	<ul style="list-style-type: none"> <li>• <a href="#">Cisco ASA 5500 Getting Started Guide, Software Version 8.0(1)</a></li> </ul>
	Cisco Catalyst 6500 Series Switch Firewall Service Modules (FWSM)	<ul style="list-style-type: none"> <li>• <a href="#">Upgrading the Catalyst 6500 Series Switch and Cisco 7600 Series Router Firewall Services Module from Release 2.x to Release 3.1</a></li> </ul>
	Cisco Catalyst 6500 Series Intrusion Detection System (IDSM-2) Module	<ul style="list-style-type: none"> <li>• <a href="#">Upgrading the Intrusion Detection System Module</a></li> </ul>
	Cisco Intrusion Prevention System Appliance IPS-4200	<ul style="list-style-type: none"> <li>• <a href="#">Installing Cisco Intrusion Prevention System Appliances and Modules 6.0</a></li> <li>• <a href="#">Cisco Intrusion Detection System Appliance and Module Installation and Configuration Guide Version 4.0</a></li> </ul>
	Management Center for Cisco Security Agents	<ul style="list-style-type: none"> <li>• <a href="#">Installing Management Center for Cisco Security Agents 5.2</a></li> </ul>
	Cisco Security Agent for CRS	<ul style="list-style-type: none"> <li>• <a href="#">Installing Cisco Security Agent for Cisco Customer Response Solutions</a></li> </ul>
	Cisco NAC Appliance (Clean Access)	<ul style="list-style-type: none"> <li>• <a href="#">Cisco NAC Appliance Hardware Installation, Version 4.1(1)</a></li> </ul>

Table 4-1 Component Installation Documentation (continued)

Product Category	Product Technology	Documentation Title
Network Management Components	Cisco Unified Operations Manager	<ul style="list-style-type: none"> <li>Installation Guide for Cisco Unified Operations Manager 2.0.1</li> <li>Quick Start Guide for Cisco Unified Operations Manager 2.0.1</li> </ul>
	Cisco Unified Service Monitor	<ul style="list-style-type: none"> <li>Quick Start Guide for Cisco Unified Service Monitor 2.0.1</li> <li>Quick Start Guide for Cisco 1040 Sensor (Service Monitor 2.0.1)</li> </ul>
	Cisco netManager Unified Communications	<ul style="list-style-type: none"> <li>Installing Cisco netManager for Unified Communications, 1.0</li> </ul>
	Cisco Unified Provisioning Manager	<ul style="list-style-type: none"> <li>Installation Guide for Cisco Unified Provisioning Manager, 1.1</li> </ul>
	Cisco Unified Service Statistics Manager	<ul style="list-style-type: none"> <li>Quick Start Guide for Cisco Unified Service Statistics Manager 1.0</li> </ul>
	Cisco Monitor Manager	<ul style="list-style-type: none"> <li>Quick Start Guide for Cisco Monitor Manager 1.1</li> </ul>
	Cisco Monitor Director	<ul style="list-style-type: none"> <li>Quick Start Guide for Cisco Monitor Director 1.1</li> </ul>
Infrastructure Components	Routers, Gateways, and Gatekeepers (H.323 and MGCP)	<ul style="list-style-type: none"> <li>Cisco 2600 Series Routers</li> <li>Cisco 2800 Series Routers</li> <li>Cisco 3700 Series Routers</li> <li>Cisco 3750 Series Voice Gateways and Gatekeepers</li> <li>Cisco 3800 Series Routers</li> <li>Cisco 7200 Series Voice Gateways</li> <li>Cisco VG200 Voice Gateways</li> </ul>
	Switches	<ul style="list-style-type: none"> <li>Cisco Catalyst 3500 Series Switches</li> <li>Cisco Catalyst 3750 Series Switches</li> <li>Cisco Catalyst 4500 Series Switches</li> <li>Cisco Catalyst 6500 Series Switches</li> </ul>
	Cisco Multiservice IP-to-IP Gateway	<ul style="list-style-type: none"> <li>Cisco Multiservice IP-to-IP Gateway Software</li> </ul>
	Cisco Telepresence Multipoint Switch	<ul style="list-style-type: none"> <li>Cisco TelePresence Multipoint Switch Release 1.0 Administration Guide, Installing CTMS Administration Software</li> </ul>

## Software Versions and System Caveats

For specific information on the product software versions used, system limitations, and known caveats, see the [System Release Notes for IP Telephony: Cisco Unified Communications System, Release 6.0\(1\)](#).

## Component Reference Configurations

Table 4-2 lists the types of IPT components that were tested in Cisco Unified Communications System Test Release 6.0(1) and provides a brief description of each. The component type in the table is linked to information that describes how the components were configured during system-level testing.

**Table 4-2** *Component Types and Descriptions*

Type	Description
<a href="#">Call Control Components</a>	<p>Call control components extend enterprise telephony features and capabilities to packet telephony network devices such as IP phones, media processing devices, voice over IP (VoIP) gateways, and multimedia applications. Additional services, such as unified messaging, multimedia conferencing, collaborative contact centers, and interactive multimedia response systems, are made possible through open telephony APIs.</p> <p>Some examples of these components are Unified Communications Manager and Cisco Unified Presence.</p>
<a href="#">Application Components</a>	<p>Application components are customized applications that help you streamline business processes and drive productivity through Internet Protocol (IP)-based Unified Communications. These components enable the rapid development, reliable execution and automated management of applications that integrate voice and video with enterprise applications and data.</p> <p>Some examples of these components are Cisco Emergency Responder and Cisco Unified Application Environment.</p>
<a href="#">Conferencing Components</a>	<p>Conferencing components provide integrated voice, video, and Web conferencing capabilities to enable remote meetings that are natural and effective with face-to-face quality, such as meetings, training sessions, and presentations.</p> <p>Some examples of these components are Cisco Unified MeetingPlace and Cisco Unified Videoconferencing.</p>
<a href="#">Voice Mail and Unified Messaging Components</a>	<p>Voice mail and unified messaging components deliver powerful voice, integrated, and unified messaging options that transparently integrate with Microsoft Exchange, Lotus Domino, and Novell GroupWise. They scale to meet the needs of large, multisite organizations and offers extensive personalization options, a broad range of productivity enhancing features, and powerful migration tools, including:</p> <ul style="list-style-type: none"> <li>• Interoperability with existing voice messaging and telephony systems</li> <li>• Custom keypad mapping of the telephony interfaces</li> <li>• Integrated context-sensitive help</li> </ul> <p>Some examples of these components are Cisco Unity and Cisco Unity Connection.</p>
<a href="#">Endpoints and Clients Components</a>	<p>Endpoint and client components integrate the management capabilities of IP-based networks with phones, pagers, and computers and use these for signaling, voice communications, and data communications.</p> <p>Some examples of these components are Cisco IP Communicator, Cisco Unified Personal Communicator, and Cisco Unified 79xx IP Phones.</p>

**Table 4-2**      **Component Types and Descriptions (continued)**

Type	Description
<a href="#">Wireless and Mobility Components</a>	<p>Wireless and mobility components provide services that enable secure, scalable, methods to real-time access to instant messaging, e-mail, and network resources. You can also access real-time simultaneous tracking of thousands of Wi-Fi devices for location-based security, high-value asset tracking, and business policy enforcement.</p> <p>Some examples of these components are Cisco Unified Mobile Communicator and Aironet Wireless Access Points.</p>
<a href="#">Security Components</a>	<p>Security components are processes and technologies designed to quickly adapt to new threats to your network by using proactive, automated, real-time threat management.</p> <p>Some examples of these components are Cisco Advanced Services Appliance ASA 5500 Series, Firewall Services Modules, and Cisco Intrusion Prevention System Appliance IPS-4200.</p>
<a href="#">Network Management Components</a>	<p>Network management components provide an integrated view of the entire Cisco Unified Communications system and present the current operational status of each element of the IP communications network. In addition these components provide a low-cost, reliable method of monitoring and evaluating the quality of calls and diagnosing issues.</p> <p>Some examples of these components are Cisco Unified Operations Manager, Cisco Unified Service Monitor, and Cisco netManager Unified Communications.</p>
<a href="#">Infrastructure Components</a>	<p>Infrastructure components are network routers, switches, software, and other standards-based networking components that provide reliable connectivity that is more resilient and enables all the latest network services.</p> <p>Some examples of these components are Cisco Series Routers, Cisco Catalyst Series Switches, and Cisco Voice Gateways.</p>

## 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](#)

## 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

In a IP telephony network, problems are typically discovered and reported by one of the following types of users:

- External users trying to reach employees within your company
- Internal users using 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 4-3](#) 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 4-3**      **Questions to Ask Users When They Report Problems**

Ask this Question...	To Determine...
<b>Did something fail or did it simply perform poorly?</b>	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.
<b>What device were you trying to use?</b>	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.

**Table 4-3** Questions to Ask Users When They Report Problems (continued)

Ask this Question...	To Determine...
<b>Did it ever work?</b>	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.
<b>Exactly what action(s) did you perform?</b>	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.
<b>What error message(s) appeared or announcements did you hear?</b>	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.
<b>What time did the problem occur?</b>	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.
<b>What is the number of the phone you used and what was the phone number you called?</b>	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.

**Table 4-3** Questions to Ask Users When They Report Problems (continued)

Ask this Question...	To Determine...
<b>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?</b>	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.
<b>Did you attempt the same action on another device?</b>	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 6.0(1) verification, Cisco Systems has performed interoperability and load testing on simulated network environments running specific software versions. The [Release Matrix](#) 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 Release Matrix, it does not necessarily mean the combination is invalid. To check interoperability for a specific device and software release, locate and review its 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 Bug Toolkit requires that you are a Cisco partner or a registered Cisco.com user with a Cisco service contract. Using the Bug Toolkit, you can find caveats for any release. To access the Bug Toolkit, go to [http://www.cisco.com/cgi-bin/Support/Bugtool/launch\\_bugtool.pl](http://www.cisco.com/cgi-bin/Support/Bugtool/launch_bugtool.pl).

## 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 IP telephony network such as:

- New user 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 4-4](#) lists the diagnostic tools and supporting troubleshooting documentation available for most components in an IP telephony 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 in each component's documentation where appropriate.

**Table 4-4 IP Telephony 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"> <li>Alarms</li> <li>Real-Time Monitoring Tool window</li> </ul> Trace log files <ul style="list-style-type: none"> <li>Communications Manager trace log</li> <li>SDL trace log (under TAC direction)</li> </ul>	<a href="#">Troubleshooting Guide for Cisco Unified Communications Manager</a> <a href="#">Cisco Unified Communications Manager Real-Time Monitoring Tool Administration Guide</a> <a href="#">Cisco Unified Serviceability Administration Guide for Cisco Unified Communications Manager</a> <a href="#">Cisco Unified Communications Manager CDR Analysis and Reporting Administration Guide</a> <a href="#">Disaster Recovery System Administration Guide</a> <a href="#">Troubleshooting TechNotes</a>
	Cisco Unified Communications Manager Business Edition	Serviceability System tools: <ul style="list-style-type: none"> <li>Alarms</li> <li>Real-Time Monitoring Tool window</li> </ul> Trace log files: <ul style="list-style-type: none"> <li>Communications Manager trace log</li> <li>SDL trace log (under TAC direction)</li> </ul>	<a href="#">Troubleshooting Guide for Cisco Unified Communications Manager</a> <a href="#">Cisco Unified Communications Manager Real-Time Monitoring Tool for Cisco Unified Communications Manager Business Edition</a> <a href="#">Cisco Unified Serviceability Administration Guide for Cisco Unified Communications Manager Business Edition</a> <a href="#">Cisco Unified Communications Manager CDR Analysis and Reporting Administration Guide for Cisco Unified Communications Manager Business Edition</a> <a href="#">Disaster Recovery System Administration Guide</a>
	Cisco Unified Communications Manager Express	IOS command line tools (such as Show commands and Debug trace utilities)	<a href="#">Installing Cisco IPC Express: Cisco Unified CallManager Express and Cisco Unity Express, “Troubleshooting” chapter</a> <a href="#">Troubleshooting TechNotes</a>
	Cisco Unified Presence	Configuration Troubleshooter Trace log files Alarms	<a href="#">Cisco Unified Presence Administration Guide, “Configuration Troubleshooter” chapter</a> <a href="#">System Error Messages for Cisco Unified Presence</a> <a href="#">Cisco IP Phone Messenger User Guide for Cisco Unified Presence, “Troubleshooting” section</a> <a href="#">Disaster Recovery System Administration Guide for Cisco Unified Presence</a>
Contact Center	Cisco Customer Response Solutions (Unified Contact Center Express)	Log files Alarms	<a href="#">Cisco CRS Servicing and Troubleshooting Guide</a> <a href="#">Troubleshooting TechNotes</a>

**Table 4-4** *IP Telephony Component Troubleshooting Tools and Documentation (continued)*

Category	Component	Diagnostic Tools Available	Information Available In...
Application	Cisco Emergency Responder	E-mail alerts sent to administrator ERL Debug tool Cisco ER Admin Utility tool Call history logs SYSLOG collector tool that generates trace and debug files Windows Event Viewer	<a href="#">Cisco Emergency Responder Administration Guide, “Troubleshooting Cisco Emergency Responder” chapter</a>
	Cisco Unified PhoneProxy	System log files: <ul style="list-style-type: none"> <li>• Shell.log</li> <li>• Update.log</li> <li>• Phoneproxy.log</li> </ul>	<a href="#">Cisco Unified PhoneProxy Administration Guide, “Troubleshooting” chapter</a>

Table 4-4 IP Telephony Component Troubleshooting Tools and Documentation (continued)

Category	Component	Diagnostic Tools Available	Information Available In...
Conferencing	Cisco Unified MeetingPlace	Log files: <ul style="list-style-type: none"> <li>Gateway SIM event log</li> <li>Error log</li> </ul> <b>gwcptrace</b> CLI command	<p>Administrator's Guide for Cisco Unified MeetingPlace Audio Server, "Troubleshooting the Cisco Unified MeetingPlace Audio Server System" chapter for voice/audio issues</p> <p>Installation and Upgrade Guide for Cisco Unified MeetingPlace Audio Server, "Troubleshooting the Cisco Unified MeetingPlace Audio Server System Installation" chapter for audio server installation issues</p> <p>Configuration Guide for Cisco Unified MeetingPlace Audio Server, "Troubleshooting the Cisco Unified MeetingPlace System Configuration" chapter for T1/E1 port and general MeetingPlace issues</p> <p>Configuration Guide for Cisco Unified MeetingPlace Web Conferencing, "Troubleshooting Cisco Unified MeetingPlace Web Conferencing" chapter for Web conferencing issues</p> <p>Administrator's Guide for Cisco Unified MeetingPlace Video Integration, "Troubleshooting" chapter for videoconferencing problems</p> <p>Administration Guide for Cisco Unified MeetingPlace for Microsoft Outlook, "Troubleshooting" chapter for Microsoft Outlook integration issues</p> <p>Administration Guide for Cisco Unified MeetingPlace Directory Services, "Troubleshooting Cisco Unified MeetingPlace Directory Services" chapter for directory services issues</p> <p>Troubleshooting TechNotes</p>
	Cisco Unified MeetingPlace Express	System logs Alarms	<p>Configuration and Maintenance Guide for Cisco Unified MeetingPlace Express, "Troubleshooting Cisco Unified MeetingPlace Express" chapter</p> <p>User Guide for Cisco Unified MeetingPlace Express, "Troubleshooting and Getting Help" chapter</p>

**Table 4-4** IP Telephony Component Troubleshooting Tools and Documentation (continued)

Category	Component	Diagnostic Tools Available	Information Available In...
Conferencing (video)	Cisco Unified Video-conferencing Video Gateway 3521, 3522, 3526, 3527, 3545	BRI/PRI link LEDs on front and rear panels BRI/PRI link LEDs viewable remotely using Gateway interface Gateway statistics	Administrator Guide for Cisco Unified Videoconferencing 3527 PRI Gateway and 3522 BRI Gateway, “Troubleshooting the Cisco Unified Videoconferencing 3500 Gateway” chapter Administrator Guide for Cisco Unified Videoconferencing 3545 PRI Gateway and 3545 Serial Gateway, “Troubleshooting the Cisco Unified Videoconferencing 3545 Gateway” chapter
	Video MCU 3515, 3540, 3545	LEDs Command line interface	Administrator Guide for Cisco Unified Videoconferencing 3515 MCU12 and MCU24, “Troubleshooting the MCU” chapter Administrator Guide for Cisco Unified Videoconferencing 3545 MCU, “Troubleshooting the MCU” chapter Troubleshooting Guide for Cisco Unified Videoconferencing 3500 MCU

**Table 4-4 IP Telephony Component Troubleshooting Tools and Documentation (continued)**

Category	Component	Diagnostic Tools Available	Information Available In...
Voice Mail and Unified Messaging	Cisco Unity	Event log Cisco Unity Diagnostic Tool (UDT): <ul style="list-style-type: none"> <li>• Macro trace logs</li> <li>• Micro trace logs</li> </ul> Voice Connector trace logs Tools Depot utilities: <ul style="list-style-type: none"> <li>• Integration Monitor</li> <li>• Call Viewer</li> <li>• Port Status Monitor</li> </ul> Dialogic tools (for systems equipped with Dialogic voice cards only): <ul style="list-style-type: none"> <li>• TSP trace logs</li> <li>• Universal Dialogic Diagnostics Utility</li> </ul> Dr. Watson logs for underlying Windows 2000 server platform	<a href="#">Troubleshooting Guide for Cisco Unity Release 5.x (With Microsoft Exchange)</a> <a href="#">Troubleshooting Guide for Cisco Unity Release 5.x (With IBM Lotus Domino)</a> <a href="#">Troubleshooting TechNotes</a>
	Cisco Unity Connection	Serviceability System tools: <ul style="list-style-type: none"> <li>• Alarms</li> <li>• Real-Time Monitoring Tool window</li> </ul> Cisco Unity Diagnostic Tool (UDT): <ul style="list-style-type: none"> <li>• Macro trace logs</li> <li>• Micro trace logs</li> </ul> CuVrt service verbose logging	<a href="#">Real-Time Monitoring Tool Administration Guide for Cisco Unity Connection</a> <a href="#">Administration Guide for Cisco Unity Connection Serviceability</a> <a href="#">Cisco Unified Serviceability Administration Guide for Cisco Unity Connection</a> <a href="#">Disaster Recovery System Administration Guide for Cisco Unity Connection</a> <a href="#">Troubleshooting TechNotes</a>
	Cisco Unity Express	CLI commands for status checking and performance monitoring SNMP alarms/events	<a href="#">Cisco Unity Express GUI Administrator Guide, “Troubleshooting Cisco Unity Express” chapter</a> <a href="#">Cisco Unity Express Voice-Mail and Auto-Attendant CLI Administrator Guide, “Troubleshooting” chapter</a> <a href="#">Troubleshooting TechNotes</a>



**Table 4-4** IP Telephony 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	<a href="#">End-User Guides</a> <a href="#">Cisco Unified IP Phone Administration Guides for Cisco Unified CallManager, “Troubleshooting and Maintenance” chapters</a> <a href="#">Error Message Decoder</a>  <a href="#">Output Interpreter</a>  <a href="#">Troubleshooting TechNotes</a>
	Cisco IP Communicator	Quality Report Tool (QRT) Error Reporting Tool	<a href="#">Cisco IP Communicator Administration Guide, “Troubleshooting Cisco IP Communicator” chapter</a> <a href="#">Cisco IP Communicator Phone Guide, “Troubleshooting Cisco IP Communicator” chapter</a> <a href="#">Troubleshooting TechNotes</a>
	Cisco Unified Personal Communicator	Cisco Unified Problem Reporting Tool (Windows version only)	<a href="#">Troubleshooting Guide for Cisco Unified Personal Communicator</a> <a href="#">User Guide for Cisco Unified Personal Communicator for Windows, “Troubleshooting” chapter for Windows version</a> <a href="#">User Guide for Cisco Unified Personal Communicator for Macintosh, “Troubleshooting” chapter for Macintosh version</a>
	Cisco Unified VT Advantage	Diagnostics Tool AutoUpdate Status Viewer CAST Viewer CDP Viewer Trace Tool Error Reporting Tool	<a href="#">Installation and Troubleshooting Guide for Cisco Unified Video Advantage, “Troubleshooting Cisco Unified Video Advantage” chapter</a> <a href="#">Cisco Unified Video Advantage User Guide, “Troubleshooting Cisco Unified Video Advantage” chapter</a> <a href="#">Troubleshooting TechNotes</a>
Network Management	Cisco Unified Operations Manager	Alarms and events appearing in Dashboard displays Phone status tests Synthetic test Node-to-node tests	<a href="#">User Guide for Cisco Unified Operations Manager</a>
	Cisco Unified Service Monitor		<a href="#">Frequently Asked Questions for Cisco Unified Service Monitor</a>

**Table 4-4 IP Telephony Component Troubleshooting Tools and Documentation (continued)**

Category	Component	Diagnostic Tools Available	Information Available In...
Communications Infrastructure	VG224 Analog Voice Gateway	IOS command line tools	<a href="#">VG224 Analog Phone Gateway Software Configuration Guide, “Using the ROM Monitor” chapter</a> <a href="#">Troubleshooting Guides</a> <a href="#">Output Interpreter</a>  <a href="#">Troubleshooting TechNotes</a>
	Cisco Catalyst 3550 Access Switch	IOS command line tools (such as Show commands and Debug trace utilities)	<a href="#">Catalyst 3550 Multilayer Switch Software Configuration Guide, “Troubleshooting” chapter</a> <a href="#">Error Message Decoder</a>  <a href="#">Output Interpreter</a>  <a href="#">Troubleshooting Tech Notes</a>
	Cisco Catalyst 3560 Access Switch	IOS command line tools (such as Show commands and Debug trace utilities)	<a href="#">Catalyst 3560 Switch Software Configuration Guide, “Troubleshooting” chapter</a> <a href="#">Catalyst 3560 Switch System Message Guide, “Catalyst 3560 Switch Debug Commands” chapter</a> <a href="#">Error Message Decoder</a>  <a href="#">Output Interpreter</a>  <a href="#">Troubleshooting Tech Notes</a>
	Cisco Catalyst 3750 Access Switch	IOS command line tools (such as Show commands and Debug trace utilities)	<a href="#">Catalyst 3750 Switch Software Configuration Guide, “Troubleshooting” chapter</a> <a href="#">Catalyst 3750 Switch System Message Guide, “Catalyst 3750 Switch Debug Commands” chapter</a> <a href="#">Error Message Decoder</a>  <a href="#">Output Interpreter</a>  <a href="#">Troubleshooting Tech Notes</a>
	Cisco Catalyst 4506 Access Switch	IOS command line tools (such as Show and Debug commands)	<a href="#">Catalyst 4500 Series Installation Guide, “Troubleshooting the Installation” chapter</a> <a href="#">Catalyst 4500 Series Switch Cisco IOS System Message Guide</a> <a href="#">Error Message Decoder</a>  <a href="#">Output Interpreter</a>  <a href="#">Troubleshooting TechNotes</a>

**Table 4-4** IP Telephony Component Troubleshooting Tools and Documentation (continued)

Category	Component	Diagnostic Tools Available	Information Available In...
Communications Infrastructure (continued)	Cisco Catalyst 6506, 6509 including Firewall Services Module (FWSM) and Communications Media Module (CMM)	IOS command line tools (such as Show commands and Debug trace utilities)	<a href="#">Catalyst 6500 Series Switch Installation Guide, “Troubleshooting” chapter</a> <a href="#">Catalyst 6500 Series Error and System Message Guides</a> <a href="#">Catalyst 6500 Series Switch and Cisco 7600 Series Router Firewall Services Module Command Reference</a> for FWSM logging configuration and system log messages <a href="#">Error Message Decoder</a>  <a href="#">Output Interpreter</a>  <a href="#">Troubleshooting TechNotes</a>

## 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.

### 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.

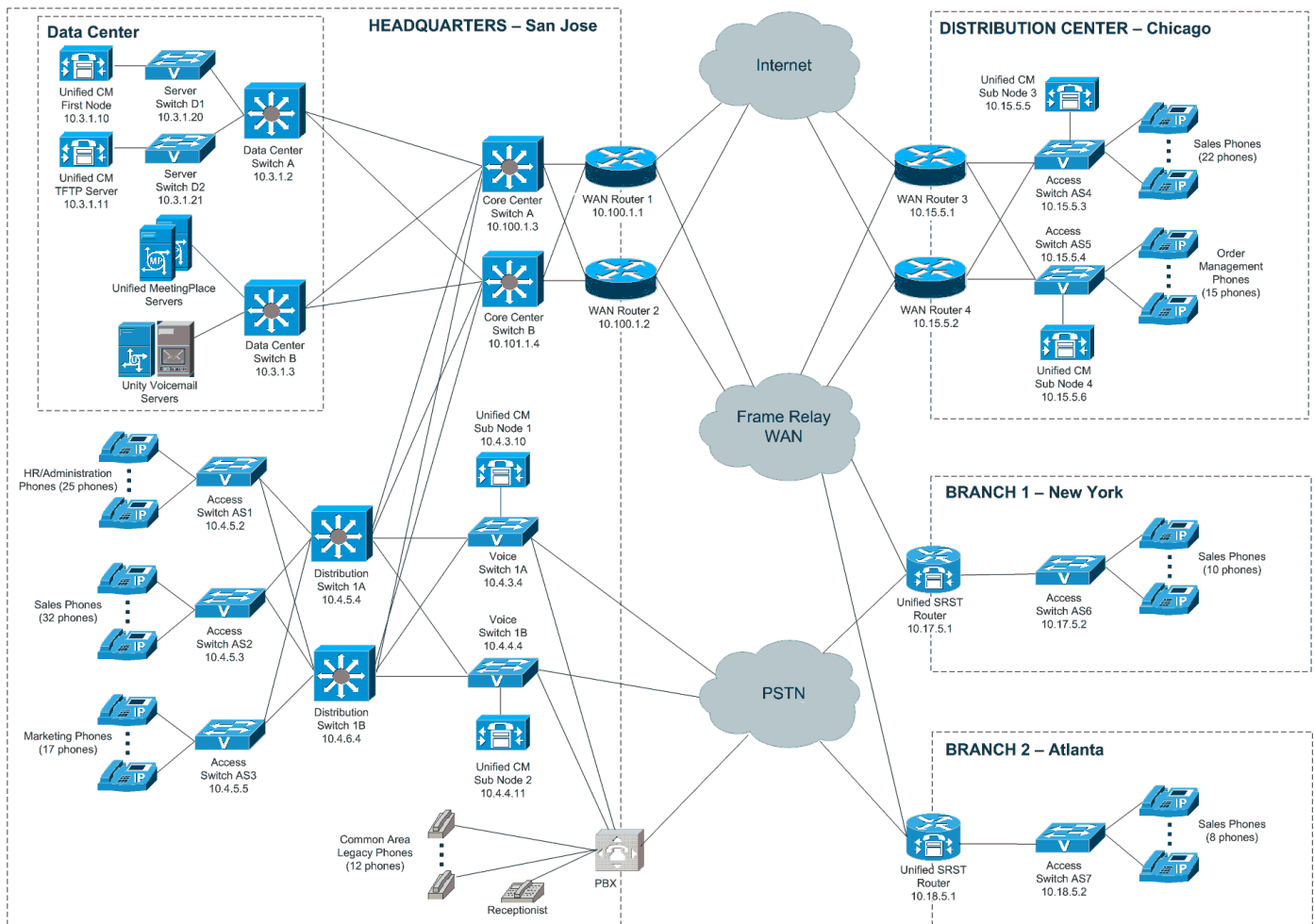


**Tip**

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 4-1 shows a typical high-level topology diagram for a medium-sized enterprise IP telephony network. Note that only device names and IP addresses are listed in the diagram.

**Figure 4-1 IP Telephony Network Topology Diagram Example**



## 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 for Cisco Unified Communications Manager, “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 for Cisco Unified Communications Manager, “Configuring Troubleshooting Trace Setting Configuration”](#) chapter.

### Debug Trace Settings for CRS and IP IVR JTAPI Client

If you encounter any problems with CRS, activate the following debug trace settings to generate debug logs:

- For CRS 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.

## Conduct User Acceptance Test

After the components are configured and integrated with other Cisco IPT 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.
- Network ready for use acceptance—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 helping to ensure that the customer 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 also the [Training Library](#) 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 Unified Communications Services](#) site.





## CHAPTER 5

# Operate

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## Introduction to Operating the System

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



**Tip**

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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.

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### 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 Operate phase produces data that will inform the Optimize phase.

### Major Tasks in This Process

- [Managing Your System](#)
- [Call Load Testing](#)
- [Backing Up and Restoring Components](#)
- [Using Network Monitoring Tools](#)
- [Troubleshooting Daily Operations](#)

## Managing Your System

This topic provides a high-level summary of the ongoing tasks 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 [Component Resources](#) 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 Select 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 Select 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.

## Call Load Testing

Call load testing captures the results of busy hour call attempts (BHCA) tests. BHCA tests measure the volume of calls generated and handled, regardless of whether the calls are answered. The BHCA data is used in capacity calculations. Review [Call Load Testing](#) for an overview of the call loads that were tested with these site models:

- Very Large Campus with Clustering over the WAN
- Multisite Centralized, Clustering over the WAN with Unified SRST
- Large SIP Site
- Cisco Unified Communications Manager 4.2(3) Interoperability Site
- Small Campus SIP Unified Communications Manager Express Site
- Small Campus H.323 Unified Communications Manager Express Site
- Medium Business with Remote Locations

See also [Develop Traffic Engineering Specifications](#) on the Design tab for more information on capacity calculations.

## 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 Communications Manager Express](#)
- [Cisco Unified Presence](#)
- [Cisco Unified Customer Response Solutions—Unified Contact Center Express](#)
- [Cisco Unified MeetingPlace](#)

- [Cisco Unity](#)
- [Cisco Unity Connection](#)
- [Cisco Unity Express](#)

## 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 that for Cisco Unified Communications Manager Business Edition, DRS will also provide backup and restore capabilities for Unity Connection.

Note also that 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](#).

## Cisco Unified Communications Manager Express

Cisco Unified Communications Manager Express is an application that runs on Cisco IOS. Therefore, for backup and restore, the IOS facility for backup and restoring configuration data would be used. For more information, see specific documents in [Cisco Unified Communications Manager Express Documentation](#).

## Cisco Unified Presence

Cisco Unified Presence will use the Disaster Recovery System (DRS) for full data backup and restore capabilities of all Unified Presence Administration. For more information, see the [Disaster Recovery System Administration Guide for Cisco Unified Presence](#).

## Cisco Unified Customer Response Solutions—Unified Contact Center Express

With the introduction of Cisco Unified Customer Response Solutions Release 5.0, the Backup and Restore System (BARS) utility is no longer required. Instead, there is a backup and restore menu option in the CRS Administration tool. The GUI interface is very similar to BARS.

For more information, see the [Cisco Unified Customer Response Solutions Administration Guide](#).

## Cisco Unified MeetingPlace

For Cisco Unified MeetingPlace, a Network Backup Gateway must be installed. For more information, see the [Administrator's Guide for Cisco MeetingPlace Network Backup Gateway](#).

For more information on the backup and restore of MeetingPlace data to the Network Backup Gateway, see the [Administration Guide for Cisco Unified MeetingPlace Audio Server](#), “Managing and Maintaining Cisco Unified MeetingPlace” chapter.

## Cisco Unity

Cisco Unity will continue to use the Disaster Recovery Backup and Restore Tool (DiRT) to provide backup of all Cisco Unity server-specific data including SQL databases, registry settings, greetings, recorded names, switch file configuration, routing rules, and subscriber passwords. If the server suffers a catastrophic failure, you must first rebuild it to the point where Cisco Unity is running as a clean, freshly installed system. At that point, the DiRT utility can be used to bring the server back to the point at which the last backup took place.

**Note**

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DiRT does not take the place of routing tape backups of your Microsoft Exchange or IBM Lotus Domino message store servers.

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For more information, see the [Maintenance Guide for Cisco Unity \(With Microsoft Exchange\)](#) or the [Maintenance Guide for Cisco Unity \(With IBM Lotus Domino\)](#).

## Cisco Unity Connection

Cisco Unity Connection will make use of the Disaster Recovery System (DRS) instead of the previously used Disaster Recovery Backup and Restore Tool (DiRT). DRS will provide backup of Unity Connection database (system and users), all files containing the audio portion of greetings and voice names, and all voice-mail messages. It will provide restoration of this data onto a clean, running installation of the same version of Unity Connection that was backed up.

All the capabilities of DRS described in the [Cisco Unified Communications Manager](#) section apply. For more information, see the [Disaster Recovery System Administration Guide for Cisco Unity Connection](#).

## Cisco Unity Express

The Cisco Unity Express voice mails can be backed up and restored using the CLI or GUI backup option. Cisco Unity Express backup and restore functions use an FTP server to store and retrieve data. Some recommended backup servers are FileZilla FTP server, GuildFTPd, Serv-U FTP server or Microsoft IIS FTP server.

For details on backing up Cisco Unity Express, see the [Cisco Unity Express Installation and Upgrade Guide](#).

# 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 tools are available:

- [Cisco Unified Operations Manager](#)
- [Cisco Unified Service Monitor](#)
- [Cisco Unified Service Statistics Monitor](#)
- [Cisco Unified Provisioning Manager](#)
- [Cisco netManager - Unified Communications](#)
- [Cisco Monitor Manager](#)
- [Cisco Monitor Director](#)

## 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.



### Note

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Cisco Unified Operations Manager is designed for large enterprise networks and each Cisco Unified Operations Manager server can monitor up to 30,000 phones. For small or medium-sized businesses up to 1000 phones or users, Cisco also offers [Cisco netManager - Unified Communications](#) that provides similar capabilities.

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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 Communications Manager Express, Cisco Unity, Cisco Unity Express, Cisco Unity Connection, Cisco Unified Contact Center Express, Cisco Emergency Responder, Cisco Unified MeetingPlace 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](http://www.cisco.com/en/US/products/ps6535/tsd_products_support_series_home.html)

## Cisco Unified Service Monitor

Cisco Unified Service Monitor monitors, evaluates, and generates reports on user experience metrics associated with active calls on the Cisco Unified Communications system. It provides a comprehensive list of voice-impairment metrics useful in troubleshooting voice-quality issues. User experience reports generated by the system also provide a listing and details of the endpoints (phones, gateways) that are most frequently affected by voice-quality issues.

Cisco Unified Service Monitor includes the following hardware and software components:

- Cisco 1040 Sensors, deployed close to the endpoint (IP phone, gateway, or voice-mail system), that monitor and evaluate call quality and report this information for active calls in near real time.
- Cisco Unified Service Monitor software operating on a Windows 2003 server platform that receives voice-quality information from Cisco 1040 Sensors as well as from Cisco Unified Communications Manager servers. Users can configure mean opinion score (MOS) thresholds on a per-codec basis; alerts are sent to an upstream application such as Cisco Unified Operations Manager when an MOS threshold is violated. This ability allows users to identify endpoints that are most affected by voice-quality issues and understand the service-quality experience at a system level.

Cisco 1040 Sensor voice-quality measurement capability can be used to measure voice quality for active calls made between a Cisco Unified IP phone and another Cisco Unified IP phone or voice gateway or voice-mail system. Additionally, Cisco Voice Transmission Quality (VTQ) support provides continuous voice-quality measurement for calls made from endpoints that support VTQ, such as Cisco Unified IP Phones 794x, 796x, or 797x. VTQ is an endpoint MOS estimation algorithm as described in the ITU P.564 standard a VTQ score represents the weighted estimate of “average user” annoyance caused by effective packet loss. The combination of Cisco 1040 Sensor functionality and VTQ support provides comprehensive voice-quality measurement to monitor key Cisco Unified IP phones (for example, executives or critical users) in real time and to track voice quality for all the calls in the system.

For more information on Cisco Unified Service Monitor, see the documentation available at:

[http://www.cisco.com/en/US/products/ps6536/tsd\\_products\\_support\\_series\\_home.html](http://www.cisco.com/en/US/products/ps6536/tsd_products_support_series_home.html)

## Cisco Unified Provisioning Manager

Cisco Unified Provisioning Manager offers a provisioning tool for Cisco Unified Communications initial deployments and also supports ongoing operational provisioning and activation services for individual subscriber changes. It can be used in integrated IP telephony, voice mail, and messaging environments that include Cisco Unified Communications Manager, Cisco Unified Communications Manager Express, Cisco Unity, Cisco Unity Express, and Cisco Unity Connection systems. Cisco Unified Provisioning Manager also provides support for provisioning Cisco Unified Mobility that is integrated into Cisco Unified Communications Manager, and the Cisco Unified Communications Manager side of Unified Presence provisioning, including client provisioning for Cisco Unified Personal Communicator. For a complete list of devices that can be provisioned, see the appropriate [Supported Device Table for Cisco Unified Provisioning Manager](#).

Cisco Unified Provisioning Manager permits standard services, such as a phone, line, or voice mail, to be ordered for subscribers and processes all changes to the underlying Cisco Unified Communications applications as a service request or an order. An order may be created to make a subscriber-level change (to a phone or line, for example) or an IP communications-level infrastructure change (such as provisioning a new calling search space or route pattern). All orders in the system are tracked and viewable, both across orders, and by subscriber name or ID. The order records show who initiated the order, the times of various process steps, and what the order contained.

Cisco Unified Provisioning Manager allows delegation of the order management so that requests for service additions, changes, or cancellations can be done without requiring an underlying knowledge of the voice applications that deliver those services. A template capability permits defining standard configurations that can be reused for new sites or location deployments. Batch provisioning permits the rollout of large numbers of subscribers at once.

For more information on Cisco Unified Provisioning Manager, see the documentation available at: [http://www.cisco.com/en/US/products/ps7125/tsd\\_products\\_support\\_series\\_home.html](http://www.cisco.com/en/US/products/ps7125/tsd_products_support_series_home.html)

## Cisco Unified Service Statistics Monitor

Cisco Unified Service Statistics Manager provides advanced statistics analysis and reporting capabilities for Cisco Unified Communications deployments. It is a Web-based software product that features a variety of advanced reports for different audiences (for example, high-level reports for executives and more detailed reports for network administrators). Cisco Unified Service Statistics Manager provides both out-of-the-box reports as well as customizable reports that provide visibility into key metrics including call volume, service availability, call quality, network resource utilization, and capacity across the entire Cisco Unified Communications system, including across multiple Cisco Unified Communications Manager clusters, gateways, and related devices.



### Note

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Cisco Unified Service Statistics Manager integrates with and relies on the data collection capabilities of [Cisco Unified Operations Manager](#) and [Cisco Unified Service Monitor](#) and those two products are prerequisites for deploying Cisco Unified Service Statistics Manager.

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Cisco Unified Service Statistics Manager uses short-term operational data collected by other Cisco network management products to perform longer-term analysis. It performs the following functions:

- Extracts data collected by [Cisco Unified Operations Manager](#) and [Cisco Unified Service Monitor](#) and stores this short-term data in the Cisco Unified Service Statistics Manager database.
- Analyzes the stored data and generates out-of-the box reports designed for users in the following roles:

- Executive (CIO/CTO)
- Operations Director
- Capacity Planner
- Network Administrator

Depending on the license level, Cisco Unified Service Statistics Manager can also:

- Enable users to customize reports based on user needs.
- Define SLA (Service Level Agreement) constructs as well as measure and verify them based on collected statistics.

For more information on Cisco Unified Service Statistics Manager, see the documentation available at: [http://www.cisco.com/en/US/products/ps7285/tsd\\_products\\_support\\_series\\_home.html](http://www.cisco.com/en/US/products/ps7285/tsd_products_support_series_home.html)

## Cisco netManager - Unified Communications

Cisco netManager - Unified Communications provides easy-to-use monitoring and diagnostics for small or medium-sized deployments of Cisco Unified Communications systems up to 1000 phones or users. It monitors all components of small and medium-sized Cisco Unified Communications system, including the underlying IP transport infrastructure and third-party devices. Cisco netManager - Unified Communications features built-in rules and thresholds as well as automatic device identification and data collection to help enable easy setup and immediate monitoring of the managed network.

Cisco netManager - Unified Communications presents the current operational status of a Cisco Unified Communications system through service-level views of the network and provides contextual tools to view current alert status and historical information and to determine the service impacts of any outages. It continuously monitors the different elements of the system including Cisco Unified Communications Manager, Cisco Unified Communications Manager Business Edition, Cisco Unified Communications Manager Express, Cisco Unity systems, Cisco Unity Express, Cisco Unity Connection, Cisco Unified Contact Center Express, Cisco Unified Presence, and Cisco Unified MeetingPlace Express, as well as Cisco gateways, routers, and switches. For a complete list of devices that can be monitored, see the appropriate [Device Support Table for Cisco netManager - Unified Communications](#).

Cisco netManager - Unified Communications also monitors third-party devices in the network, such as servers, workstations, printers, and other networking devices and provides basic availability monitoring for each. It features an extensible monitoring framework through which coverage may be extended by adding different active monitors based on supported protocols such as HTTP, Simple Network Management Protocol (SNMP), or Windows Management Instrumentation (WMI), that help enable custom monitoring for both Cisco and third-party devices.

Other Cisco netManager - Unified Communications capabilities include:

- Visibility into network connectivity and related information by means of a real-time physical connectivity view that not only shows interconnections between different devices but also presents the current operational status of each of the devices and applications in the network.
- Up-to-date information about connectivity-related and registration-related outages affecting all IP phones (both SIP and SCCP-based phones) in the system, as well as additional contextual information to help locate and identify the IP phones.
- Tracking of Cisco Unified Communications devices and IP phone inventory, tracks IP phone status changes, and creates a variety of reports that conveniently summarize move, add, and change operations on IP phones in the network.
- Easy integration into customer monitoring and troubleshooting workflows by means of notification mechanisms such as SNMP traps, Short Message Service (SMS), and E-mails.

- Real-time reports and historical reports, including
  - Device and device group reports that focus on performance and availability.
  - Phone reports that provide IP phone inventory and status information for all IP phones in the deployment.
  - Performance reports for a selected device or device group.
  - Problem area reports that display alerts reported across the network across different data sources (such as SNMP traps, syslogs, event logs, performance errors, and top N outages).
  - Event historical reports of all events generated by Cisco netManager - Unified Communications for a specified device or device group.
  - General reports on application logs and user activity.
- Visibility into key performance metrics, such as CPU utilization, memory utilization, interface utilization (bandwidth), hard drive utilization, and ping availability, that aid in troubleshooting.

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

[http://www.cisco.com/en/US/products/ps7243/tsd\\_products\\_support\\_series\\_home.html](http://www.cisco.com/en/US/products/ps7243/tsd_products_support_series_home.html)

## Cisco Monitor Manager

Cisco Monitor Manager provides monitoring of key device parameters on Cisco small or medium-sized business class routers, switches, voice gateways, Cisco Unified Communications 500 Series for Small Business, Cisco Unified Communications Manager Express, Cisco Unity Express, security appliances, access points, and Cisco Unified IP phones. For a complete list of devices that can be monitored, see the [Supported Devices Table for Cisco Monitor Manager](#).

Cisco Monitor Manager monitors the network 24 hours, 7 days a week, and periodically polls and collects inventory and performance-monitoring data from the managed Cisco devices in the network. It is a Microsoft Windows-based application that is completely nondisruptive to system operations and does not deploy any agent software on managed devices.

Cisco Monitor Manager can be used as a standalone network-monitoring application or as part of a managed service offering startup package. It performs automatic discoveries of the entire underlying network infrastructure and Cisco Unified Communications system. The application provides a real-time physical view, service-level details, and the current operational status of each element in the network.

For more information on Cisco Monitor Manager, see the documentation available at:

[http://www.cisco.com/en/US/products/ps7244/tsd\\_products\\_support\\_series\\_home.html](http://www.cisco.com/en/US/products/ps7244/tsd_products_support_series_home.html)

## Cisco Monitor Director

Cisco Monitor Director is a remote network monitoring and management application that works with one or more instances of [Cisco Monitor Manager](#) to provide centralized network management across multiple small or medium-sized business customer sites. Cisco Monitor Director stores network fault data received from associated Cisco Monitor Manager instances and uses this data (which can be selectively filtered) to create monthly reports that summarize a network's health. It also provides the capability to specify that only issues of a certain severity or type generate notification messages, ensuring that network administrators are notified of critical issues.

The Cisco Monitor Director provides:

- Central dashboard
- Secure communication between customers and resellers
- Syslog reporting
- Real-time alerts and notifications
- License monitoring and inventory alerts
- End of Life/End of Sales reports
- Scheduled monthly reports

For more information on Cisco Monitor Director, see the documentation available at: [http://www.cisco.com/en/US/products/ps7246/tsd\\_products\\_support\\_series\\_home.html](http://www.cisco.com/en/US/products/ps7246/tsd_products_support_series_home.html)

## 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](#)
- [Problems Caused by Password Changes](#)
- [PBX Interoperability Issues with Cisco Unified Communications Manager](#)
- [Using Call Flows to Resolve Call Processing Problems](#)
- [Failover and Recovery Procedures](#)

### Common Problems Reported by Users

This section describes basic approaches to diagnose and resolve common problems reported by end users in an IP telephony environment. 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](#)
- [Call Indication Without a Connection](#)
- [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 IP telephony 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

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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.

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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.

### Call Indication Without a Connection



Note

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The information in this section will be available in a future release.

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### 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.

## Problems Caused by Password Changes

In general, Cisco Systems strongly recommends that you do not change passwords on Cisco devices once they are set during the initial installation (naturally, you should change the passwords from the factory defaults during the installation process but not after the devices are put into operation). In the event that you decide to change passwords, the following sections describe the rules, restrictions and impact of modifying the following passwords:

- [Passwords Used in Cisco Unified Communications Manager Configuration](#)
- [Passwords in a Cisco Customer Response Solutions Environment](#)

### Passwords Used in Cisco Unified Communications Manager Configuration

The following passwords are used in Cisco Unified Communications Manager 5.0 configuration:

- [Platform Administrator Password](#)
- [Security Password](#)
- [Cisco Unified Communications Manager Administration Passwords](#)

#### Platform Administrator Password



**Note**

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The information in this section will be available in a future release.

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#### Security Password



**Note**

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The information in this section will be available in a future release.

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#### Cisco Unified Communications Manager Administration Passwords



**Note**

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The information in this section will be available in a future release.

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## Passwords in a Cisco Customer Response Solutions Environment

This section provides information about passwords in the Cisco Customer Response Solutions 4.0(2) configuration:

- **Customer Response Solutions Server Password**—This is the Windows Administrator’s password for the server on which Customer Response Solutions is installed. This password is used during the installation (or upgrade) of Customer Response Solutions and should be the same on all Customer Response Solutions servers in the cluster.
- **Customer Response Solutions Account Password Phrase**—When you install or upgrade Customer Response Solutions, you are prompted to enter an Account Password Phrase. Customer Response Solutions uses the string that you enter to create a unique, encrypted password for the Customer Response Solutions Administrator account and for the services running under this account (CCMServices). This password phrase should be the same on all Customer Response Solutions servers in the cluster. To change this password phrase after installation, use the Customer Response Solutions AdminUtility.
- **Cisco Unified Communications Manager Password**—The Cisco Unified Communications Manager password is used during the installation (or upgrade) of Customer Response Solutions and for:
  - **JTAPI Provider**—When configuring a JTAPI Provider, you must specify the Cisco MCS that is running Cisco Unified Communications Manager CTI Manager and provide the Windows Administrator ID and password for the Cisco Unified Communications Manager server.




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**Note** If the LDAP setting is Microsoft Active Directory instead of DC, you must manually set this password using Active Directory.

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- **JTAPI Client**—When configuring a JTAPI Client, you must specify the Cisco MCS that is running Cisco Unified Communications Manager and provide the Windows Administrator ID and password for the Cisco Unified Communications Manager server.
- **Cisco Agent Desktop**—When logging into Cisco Agent Desktop, agents use their Cisco Unified Communications Manager user ID and password.
- **Unified Communications Manager Security Password**—The Unified Communications Manager Security Password set for the Unified Communications Manager services is used by Customer Response Solutions. If you change the Security Password for Unified Communications Manager services, you must update the password on the Customer Response Solutions servers using the AdminUtility.




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**Note** If the Cisco Desktop VoIP Monitor Server Service or Cisco Desktop Sync Server Service fails to start and you receive error 1069, you must synchronize the passwords on the Cisco Unified Communications Manager servers and the Cisco Customer Response Solutions Server.

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- **LDAP Administrator Password**—Cisco Customer Response Solutions typically requires a single LDAP account with administrator privileges. The LDAP Administrator Password is set during Customer Response Solutions installation. You cannot reset it using the LDAP Server information web page. You can reset it only using the Customer Response Solutions Serviceability Utility. If you change the LDAP password, be sure to update the password in Customer Response Solutions in Cisco Customer Response Solutions LDAP Information.

## PBX Interoperability Issues with Cisco Unified Communications Manager

If calls to destinations outside the IP network are failing, it may be because the calls must be routed through non-Cisco PBX switches that are connected to the PSTN. In order for the Cisco Unified Communications Manager to properly direct calls out trunks on the PBX, proper interoperability configuration is required. Information on configuring PBXs to interoperate with Cisco devices is available on an [Interoperability Portal](#) site. This site has information on third-party PBX interoperability with the following Cisco Unified Communications products:

- Cisco Unified Communications Manager
- Cisco Unity
- Cisco Unified Contact Center Enterprise
- Cisco Unified MeetingPlace

The information is provided in a series of application notes. If you cannot find your exact configuration in the list of available application notes, you may be able to use other application notes to meet your needs. Here are some suggestions:

- PBX product families should have similar results. For example:
  - PBXs in the Nortel Meridian 1 family should have similar results. The Nortel Meridian 1 Option 11C will have similar configurations as the Nortel Meridian 1 Option 61C and the Nortel Meridian 1 Option 81C.
  - PBXs in the Avaya Definity G3 family should be similar. The versions VSI, R, CSI, and SI should have similar configurations.
  - PBXs in the Siemens 300 family also should have similar configuration results. This family includes the 330, 340, and 370.
- Gateways configurations should be similar if the gateways are Cisco IOS based and have the same protocol (for example, MGCP, H.323, or SIP). For example, a Cisco 2801 gateway should have similar configurations to the 3845 when used with the Cisco Unified Communications Manager.

## Using Call Flows to Resolve Call Processing Problems

This topic provides information about a typical call flow in an IP telephony environment. [Figure 5-1](#) shows a call flow that illustrates the actions in a typical call between the following devices at two different sites:

- Cisco Unified IP Phone (SCCP)
- Cisco Unified Communications Manager
- Gatekeeper

Figure 5-1 Call Flow in an IP Telephony Environment

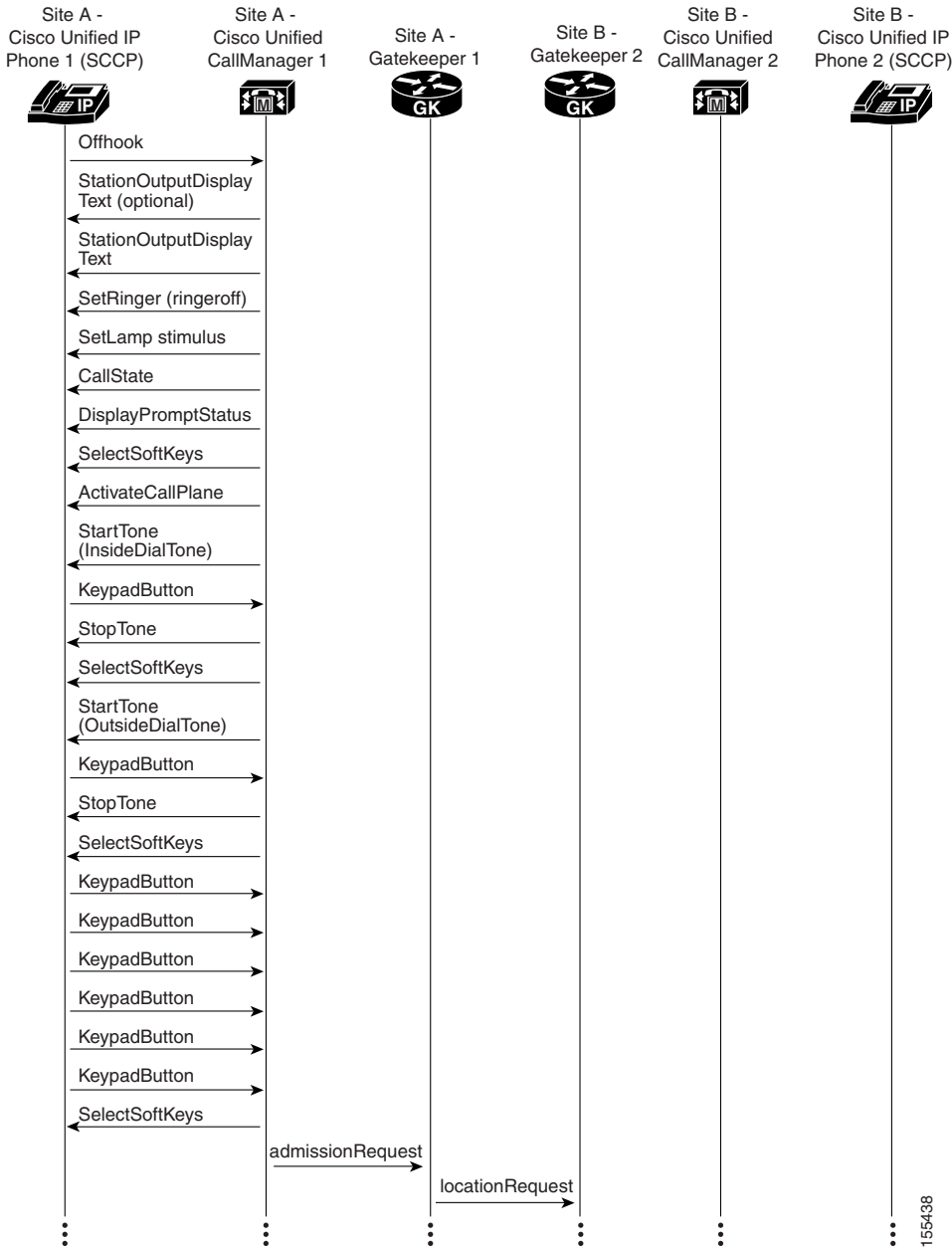
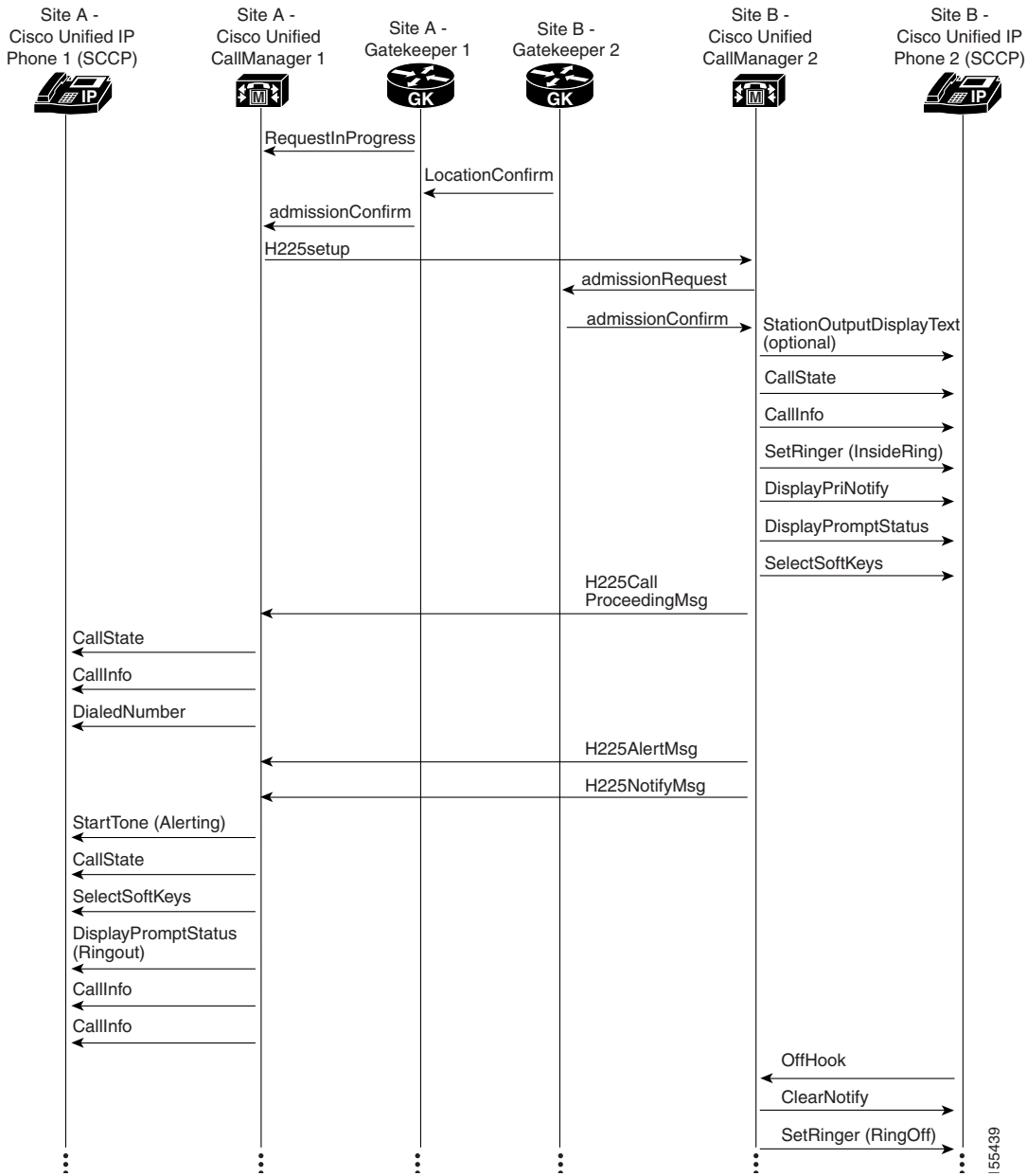


Figure 5-2 Call Flow in an IP Telephony Environment (continued)



155439

Figure 5-3 Call Flow in an IP Telephony Environment (continued)

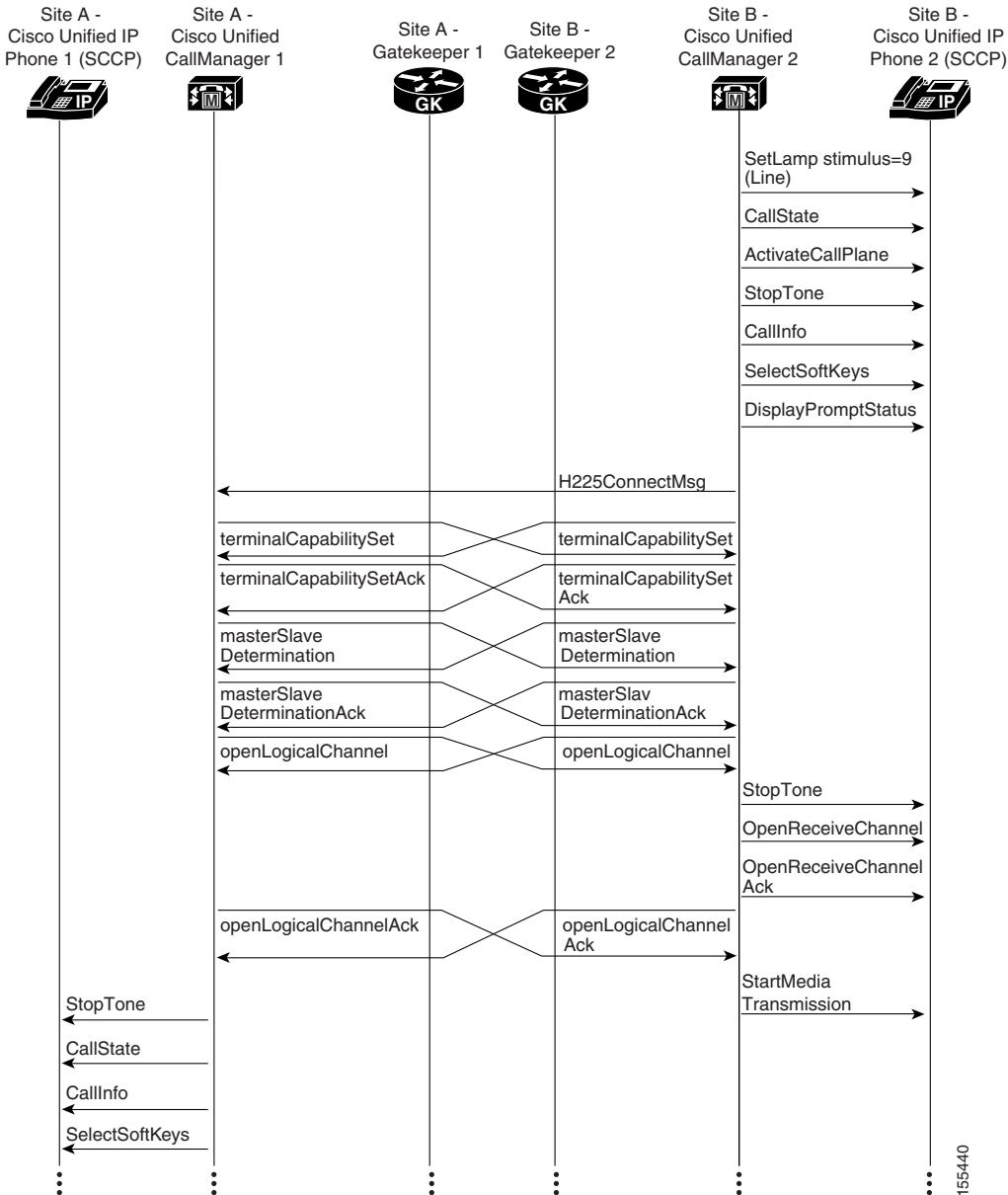


Figure 5-4 Call Flow in an IP Telephony Environment (continued)

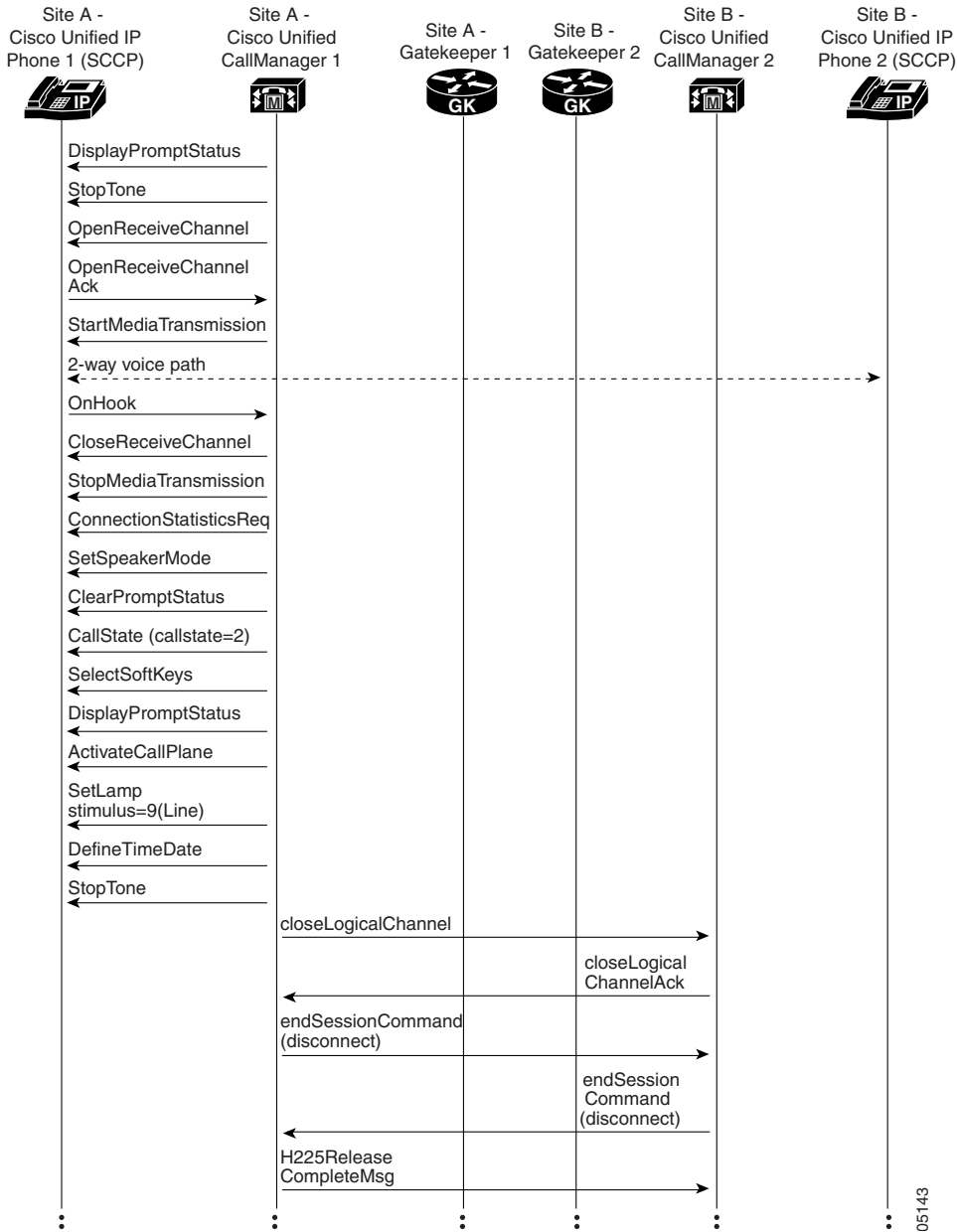
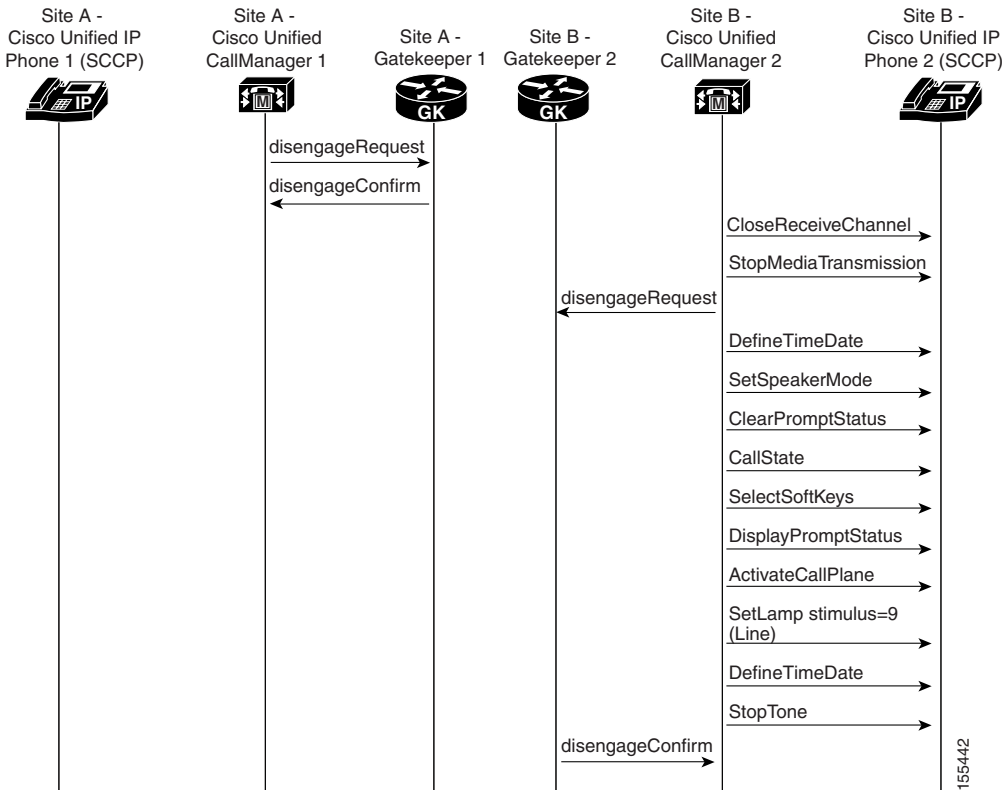


Figure 5-5 Call Flow in an IP Telephony Environment (continued)



For both successful and unsuccessful calls, an industry-standard cause code value appears in the disconnect or release signaling messages. The cause code reveals if the call was disconnected normally (typically cause code 16) or abnormally. Table 5-1 lists the standard cause values that may appear in the trace files as part of disconnect processing.

Table 5-1 Disconnect Cause Code Values

Hexadecimal Code with High-Order Bit Set	Hexadecimal Code Without High-Order Bit Set	Decimal Code	Description
0x81	0x01	1	Unallocated (unassigned) number. This cause indicates that the destination requested by the calling user cannot be reached because the number is unassigned. This number is not in the routing table, or it has no path across the ISDN network.
0x82	0x02	2	No route to specified transit network (National use). This number was dialed with a transit network code such as 108880 to go from AT&T and MCI, and there is no route across. The wrong transit network code was dialed.
0x83	0x03	3	No route to the destination. The dialed number is in the routing plan, but there is no physical route to the destination. The most likely cause of this is that the PRI D-channel is down, or the span or WAN is not connected correctly.
0x84	0x04	4	Send special information tone.

**Table 5-1**      **Disconnect Cause Code Values (continued)**

Hexadecimal Code with High-Order Bit Set	Hexadecimal Code Without High-Order Bit Set	Decimal Code	Description
0x85	0x05	5	Misdialed trunk prefix (National use).
0x86	0x06	6	Channel unacceptable.
0x87	0x07	7	Call awarded and being delivered in an established channel.
0x88	0x08	8	Preemption.
0x89	0x09	9	Preemption. Circuit reserved for reuse.
0x90	0x10	16	Normal call clearing. This is one of the most common codes and is received for many reasons. It usually occurs because someone hung up the call.
0x91	0x11	17	User busy. The number dialed is busy and cannot receive any more calls.
0x92	0x12	18	No user responding. The number that is being dialed has an active D-channel, but the far end chooses not to answer.
0x93	0x13	19	No answer from the user (user alerted). The number that is being dialed has an active D-channel, but the far end chooses not to answer.
0x94	0x14	20	Subscriber absent.
0x95	0x15	21	Call rejected.
0x96	0x16	22	Number changed. This cause code is generated when a subscriber on the PSTN has changed his or her phone number. Usually this message is accompanied by a progress indicator stating that in-band information is available. The PSTN provides an announcement in-band indicating the new phone number, if available.
0x9A	0x1A	26	Nonselected user clearing.
0x9B	0x1B	27	Destination is out of order. The number dialed is a working number, but the span is not active.
0x9C	0x1C	28	Invalid number format (address incomplete). This can happen when you are calling out using a network type number (enterprise) when you should be calling out Unknown or National.
0x9D	0x1D	29	Facility rejected.
0x9E	0x1E	30	Response to STATUS ENQUIRY.
0x9F	0x1F	31	Normal, unspecified. This is another common code. It happens when the network cannot determine what to do with the call being made.
0xA2	0x22	34	No circuit/channel is available. No B-channels are available to make the selected call.
0xA6	0x26	38	Network is out of order.
0xA7	0x27	39	Permanent frame mode connection is out of service.
0xA8	0x28	40	Permanent frame mode connection is operational.
0xA9	0x29	41	Temporary failure. The call was disconnected due to a network failure. This code appears for some long distance providers if the hunt sequence is incorrect. PRI lines must be set up for a flex hunt sequence (not a float hunt sequence).
0xAA	0x2A	42	Switching equipment congestion.

**Table 5-1 Disconnect Cause Code Values (continued)**

Hexadecimal Code with High-Order Bit Set	Hexadecimal Code Without High-Order Bit Set	Decimal Code	Description
0xAB	0x2B	43	Access information discarded. Usually reported when the far-end ISDN switch removes some piece of information before tandem-switching a call. For example, some PBXs strip the display IE before sending a call out toward the PSTN and send back a message with this cause code.
0xAC	0x2C	44	Requested circuit/channel is unavailable. This happens when you get in a glare condition: Both sides are selected top-down or bottom-up. Change the Allocation Direction (so that one end is top-down and the other is bottom-up).
0xAE	0x2E	46	Precedence call blocked.
0xAF	0x2F	47	Resource unavailable, unspecified. Whenever you see Cisco Unified Communications Manager initiate a disconnect with cause code 0xAF, 99% of the time the problem is related to a media setup failure. Check for codec capabilities mismatches, especially your regions configuration.
0xB1	0x31	49	Quality of service unavailable.
0xB2	0x32	50	Requested facility not subscribed. This code typically indicates you are trying to use a service you are not permitted to use. For example, you might be trying to make a voice call on an ISDN circuit provisioned for data only.
0xB5	0x35	53	Outgoing calls barred within Closed User Group (CUG).
0xB7	0x37	55	Incoming calls barred within CUG.
0xB9	0x39	57	Bearer capability not authorized. This code indicates that you are placing a call with a bearer capability you are not allowed to use.
0xBA	0x3A	58	Bearer capability not presently available. This code indicates that you are placing a call with a bearer capability for which the service provider does not currently have capacity to supply.
0xBE	0x3E	62	Inconsistency in designated outgoing access information and subscriber class.
0xBF	0x3F	63	Service or option unavailable, unspecified.
0xC1	0x41	65	Bearer capability not implemented. The cause could be one of the following occurrences: <ul style="list-style-type: none"> <li>• You need to change the PCM Type value to the setting appropriate for your country. This is the most common cause, especially in countries where G.711 A-law companding is the standard. If your gateway is configured for <math>\mu</math>-law and the service provider or PBX is expecting A-law, you will see calls disconnected with this cause code.</li> <li>• The central office (CO) does not understand an information element in the setup message.</li> <li>• You are connected to a PBX and you are sending out a network type number when the switch accepts only Unknown or National.</li> <li>• You are selecting European PRI and you have the progress indicators turned on when they should be off.</li> </ul>
0xC2	0x42	66	Channel type not implemented.
0xC5	0x45	69	Requested facility not implemented.

**Table 5-1**      **Disconnect Cause Code Values (continued)**

Hexadecimal Code with High-Order Bit Set	Hexadecimal Code Without High-Order Bit Set	Decimal Code	Description
0xC6	0x46	70	Only restricted digital information bearer capability is available (National use).
0xCF	0x47	79	Service or option not implemented, unspecified.
0xD1	0x51	81	Invalid call reference value. This code indicates that the far-end switch did not recognize the call reference for a message sent by the gateway.
0xD2	0x52	82	Identified channel does not exist. This code indicates a call attempt on a channel that is not configured on the far end. This could happen if you are using a fractional PRI. As of Cisco Unified Communications Manager Release 3.3, fractional PRIs are no longer supported.
0xD3	0x53	83	A suspended call exists, but this call identity does not.
0xD4	0x54	84	Call identity in use.
0xD5	0x55	85	No call suspended.
0xD6	0x56	86	Call having the requested call identity has been cleared.
0xD7	0x57	87	User is not a member of CUG.
0xD8	0x58	88	Incompatible destination. The cause could be one of the following occurrences: <ul style="list-style-type: none"> <li>• The number being dialed is not capable of the type of call.</li> <li>• You are calling a restricted line in unrestricted mode.</li> <li>• You are calling a POTS phone using unrestricted mode.</li> </ul>
0xDA	0x5A	90	Nonexistent CUG.
0xDB	0x5B	91	Invalid transit network selection (National use).
0xDF	0x5F	95	Invalid message, unspecified.
0xE0	0x60	96	Mandatory information element is missing. The far-end switch states that a message was received missing an information element it considers to be mandatory per the Q.931 specification.
0xE1	0x61	97	Message type nonexistent or not implemented.
0xE2	0x62	98	Message is incompatible with the call state, or the message type is nonexistent or not implemented. This code is usually indicative of an ISDN protocol mismatch. Each ISDN protocol variant has a slightly different state machine based on the state machines defined in the Q.931 specification. If the two sides of an ISDN connection are not configured for the same protocol, one side might violate the other's call state machine. If an ISDN message is sent that is not expected in the current call state, this cause is generated.
0xE3	0x63	99	An information element or parameter does not exist or is not implemented.

**Table 5-1 Disconnect Cause Code Values (continued)**

Hexadecimal Code with High-Order Bit Set	Hexadecimal Code Without High-Order Bit Set	Decimal Code	Description
0xE4	0x64	100	Invalid information element contents. The cause could be one of the following occurrences: <ul style="list-style-type: none"> <li>The call has an information element that is not understood by the switch being called. The E4 is usually followed by the information element that is causing the problem.</li> <li>The most common problem is that you are trying to place a call using a network number when the switch being called accepts only National, International, or Unknown dialing.</li> <li>This code is also generated when you are using Network-Specific Facilities as an element when they are not needed.</li> </ul>
0xE5	0x65	101	The message is incompatible with the call state. This code is usually indicative of an ISDN protocol mismatch. Each ISDN protocol variant has a slightly different state machine based on the state machines defined in the Q.931 specification. If the two sides of an ISDN connection are not configured for the same protocol, one side might violate the other's call state machine. If an ISDN message is sent that is not expected in the current call state, this cause is generated.
0xE6	0x66	102	Recovery on timer expiry. This occurs when ISDN messages don't arrive in specified time according to the Q.931 specification. The E6 is sometimes followed by the timer that has expired (for example, 03 01 00—the 310 timer).
0xE7	0x67	103	Parameter nonexistent or not implemented—passed on (National use).
0xEE	0x6E	110	Message with unrecognized parameter discarded.
0xEF	0x6F	111	Protocol error, unspecified.
0xFF	0x7F	127	Interworking, unspecified.

## 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](#).

## Features and Applications

This topic addresses various operational features and functions that can be employed in a Cisco Unified Communications system. The following features are discussed:

- [Silent Monitoring and Recording Using 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 Unified Communications Services](#) site.





# CHAPTER 6

## Optimize

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### 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 increase your capacity.



**Tip**

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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.

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#### **Input to This Process**

Your network has been operational for some period of time and is ready to optimize 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 a System Upgrade](#)

## Performing a System Upgrade

#### **Before You Begin**

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

### Upgrade IPT Software Components


Once you have your upgrade plan and preparations in place, perform your system upgrade following the guidelines and sequence in [Upgrading IPT Components](#):

- See [IPT Deployment Models](#) for the general upgrade sequence for the various components in the different deployment models, including IPT Single Site, IPT Multisite Centralized and SRST, and IPT Multisite WAN Distributed.
- See [Upgrading IPT Components](#) for system-level upgrade procedures for each major upgrade strategy: single-stage system upgrade, multistaged system upgrade, and multistaged migration upgrade.

For related documentation on compatibility and component upgrades, see these topics:

- [Compatibility Guides](#)
- [Component Release Notes and Installation and Upgrade Documentation](#)

## 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.

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



## CHAPTER 7

# Resource Library

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## Using the Resource Library

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

- [Cisco Unified Communications System Description](#)
- [Cisco Unified Communications System Release Notes](#)
- [Network Topology Resources](#)
- [Ordering Guides](#)
- [Troubleshooting Individual Components](#)
- [Component Resources](#)
- [Configuration Command Files](#)
- [System Test Results](#)
- [End-of-Sale and End-of-Life Products](#)
- [Cisco Unified Communications System Demo](#)

### Cisco Unified Communications System Description

For Release 6.0(1):

[Cisco Unified Communications System Description](#) (right-click to download PDF)

### Cisco Unified Communications System Release Notes

[System Release Notes for IP Telephony: Cisco Unified Communications System, Release 6.0\(1\)](#)

## Network Topology Resources

This topic provides topology resources that you can use to document network plans. Specifically, it includes:

- [Microsoft Visio Network Topology Diagrams](#) as individual Microsoft Visio files

- [How to Use Microsoft Visio Drawings Efficiently](#), guidelines for best practices in using Microsoft Visio files

## Microsoft Visio Network Topology Diagrams

You can download zip files containing Visio drawings of the logical and physical topologies for IP telephony. [Table 7-1](#) identifies the Visio drawings in each zip file.



### Note

You need Microsoft Visio 2003 to open the files.

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

**Table 7-1** Microsoft Visio Topology Diagrams

Description	Filename
Zip file includes the site model topology drawings listed below.	<a href="#">IPT_UC601_SiteModels.zip</a> (right-click to download zip) 5.3 MB <b>Note</b> 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 test sites in North America Multisite Distributed deployment	SiteModel_NorthAmerica_All.vsd
Very Large Campus Clustering over the WAN (SJC-RFD) site model	SiteModel_LargeCampus_SJCRFD.vsd
Multi-Site Centralized, Clustering over the WAN with Unified SRST (SFO-ORD) site model	SiteModel_MultiCentralized_SFOORD.vsd
Large SIP Site (DFW) site model	SiteModel_LargeSIP_DFW.vsd
Medium Business with Remote Locations (AZO) site model	SiteModel_MediumBusiness_AZO.vsd
Small Campus Unified Communications Manager Site (RXB) site model	SiteModel_SmallUnifiedCM_RXB.vsd
Small Campus SIP Unified Communications Manager Express Site (ATL) site model	SiteModel_SmallSIPCME_ATL.vsd
Small Campus H.323 Unified Communications Manager Express Site (YYZ) site model	SiteModel_SmallH323CME_YYZ.vsd
Cisco CallManager Release 4.2(3) Interoperability Site (NYC) site model	SiteModel_CallManager42Interop_NYC.vsd
Cisco Unified CallManager Release 5.1(1) Interoperability Site (RDU) site model	SiteModel_CallManager51Interop_RDU.vsd
All test sites in Europe and Emerging Markets (EUEM) Multisite Distributed deployment	SiteModel_EUEM_All.vsd
EUEM Cisco Unified CallManager Interoperability Site (LGW) site model	SiteModel_EUEM_UnifiedCMInterop_LGW.vsd
EUEM Medium Site (GVA) site model	SiteModel_EUEM_MediumSite_GVA.vsd

**Table 7-1** Microsoft Visio Topology Diagrams (continued)

Description	Filename
EUEM Large Multisite Centralized with Unified SRST (CDG) site model	SiteModel_EUEM_MultiCentral_CDG.vsd
EUEM Small Campus Multisite H.323 (WAW) site model	SiteModel_EUEM_MultiH323_WAW.vsd
EUEM Non-Cisco Unified CallManager Interoperability Site (RKV) Site model	SiteModel_EUEM_SIPSite_RKV.vsd
EUEM Small Site (MAD) site model	SiteModel_EUEM_SmallSite_MAD.vsd
Zip file includes component topology drawings listed below.	<p><a href="#">IPT_UC601_Components.zip</a> (right-click to download zip) 4.2 MB</p> <p><b>Note</b> 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.</p>
Cisco Unified Communications UC550 configured for T.37 fax	UC500_fax.vsd
Cisco Unified Communications UC500 configuration	UC500.vsd
Cisco TelePresence Multipoint Switch	Telepresence.vsd
Cisco Unified MeetingPlace Topology in Multisite Distributed Deployment	MeetingPlace_Topology.vsd
QSIG connections to Cisco Unified Communications Manager clusters	QSIG_UnifiedCM_Clusters.vsd
QSIG connections to Cisco Unified Communications Manager Express sites	QSIG_UnifiedCMEExpress.vsd
Cisco Unity logical topology	Unity_Logical_Topology.vsd
Cisco Unity and Unity Connection physical topology - North America	Unity_NA_Site_Topology.vsd
Cisco Unity setup in EUEM test environment	Unity_EUEM_Site_Topology.vsd
Cisco Unified CallManager Express integrated with Cisco IP-to-IP Gateways	CME_IPIP_Gateways.vsd
Security test topology using Cisco Catalyst Firewall Security Module (FWSM)	SecurityTopology_FWSM.vsd
Security test topology using Cisco Adaptive Security Appliance (ASA) Firewalls	SecurityTopology_ASA.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.

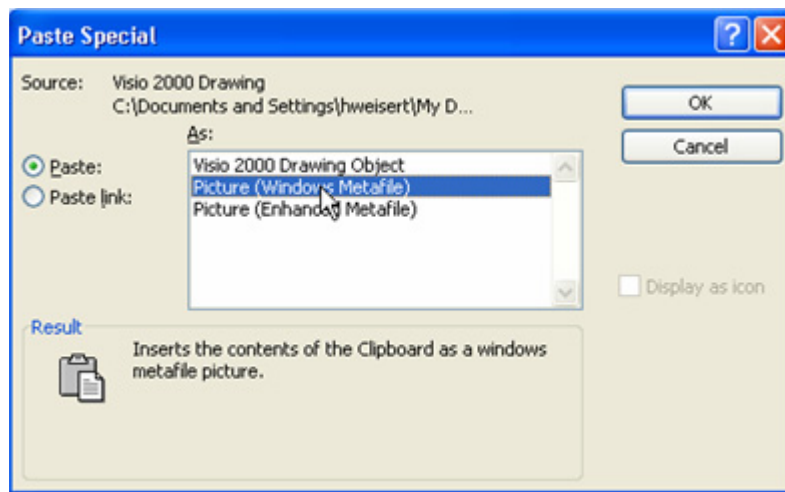
When you copy and paste a Visio drawing into another application, the Visio object includes all the application data with the drawing. This object information is needed if you want to be able to double-click the drawing from Word or Powerpoint and have it open up in Visio for editing. But pasting

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.

## Ordering Guides

Ordering guides for most Cisco Unified Communications products are available for partners and Cisco employees. For information on ordering guides, go to the following URL:

[http://www.cisco.com/web/partners/sell/technology/ipc/announcements/unified\\_communications\\_system\\_6\\_launch.html](http://www.cisco.com/web/partners/sell/technology/ipc/announcements/unified_communications_system_6_launch.html) 

Click the “What is available for Partners” tab to view a list of the ordering guides and other marketing collaterals.

## Troubleshooting Individual Components

See the table [IP Telephony Component Troubleshooting Tools and Documentation](#) on the Implement tab for individual component troubleshooting information.

## Component Resources

[Table 7-2](#) 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 Upgrade](#) and [Component Reference Configurations](#) on the Implement tab.

**Table 7-2** *Component Resources Documentation*

Category	Component	Documentation URL
General	Voice documentation	<a href="http://www.cisco.com/en/US/products/sw/voicesw/tsd_products_support_category_home.html">http://www.cisco.com/en/US/products/sw/voicesw/tsd_products_support_category_home.html</a>

Table 7-2 Component Resources Documentation (continued)

Category	Component	Documentation URL
Call Control	Cisco Unified Communications Manager	<a href="http://www.cisco.com/en/US/products/sw/voicesw/ps556/tsd_products_support_series_home.html">http://www.cisco.com/en/US/products/sw/voicesw/ps556/tsd_products_support_series_home.html</a>
	Cisco Unified Communications Manager Business Edition	<a href="http://www.cisco.com/en/US/products/ps7273/tsd_products_support_series_home.html">http://www.cisco.com/en/US/products/ps7273/tsd_products_support_series_home.html</a>
	Cisco Unified Communications Manager Express	<a href="http://www.cisco.com/en/US/products/sw/voicesw/ps4625/tsd_products_support_series_home.html">http://www.cisco.com/en/US/products/sw/voicesw/ps4625/tsd_products_support_series_home.html</a>
	Cisco Unified Survivable Remote Site Telephony (SRST)	<a href="http://www.cisco.com/en/US/products/sw/voicesw/ps2169/tsd_products_support_series_home.html">http://www.cisco.com/en/US/products/sw/voicesw/ps2169/tsd_products_support_series_home.html</a>
	Cisco Unified Presence	<a href="http://www.cisco.com/en/US/products/ps6837/tsd_products_support_series_home.html">http://www.cisco.com/en/US/products/ps6837/tsd_products_support_series_home.html</a>
	Cisco Unified Communications 500 Series for Small Business	<a href="http://www.cisco.com/en/US/products/ps7293/tsd_products_support_series_home.html">http://www.cisco.com/en/US/products/ps7293/tsd_products_support_series_home.html</a>
Contact Center	Cisco Customer Response Solutions (Cisco Unified Contact Center Express)	<a href="http://www.cisco.com/en/US/products/sw/custcosw/ps1846/tsd_products_support_series_home.html">http://www.cisco.com/en/US/products/sw/custcosw/ps1846/tsd_products_support_series_home.html</a>
Applications	Cisco Emergency Responder	<a href="http://www.cisco.com/en/US/products/sw/voicesw/ps842/tsd_products_support_series_home.html">http://www.cisco.com/en/US/products/sw/voicesw/ps842/tsd_products_support_series_home.html</a>
	Cisco Fax Server	<a href="http://www.cisco.com/en/US/products/ps6178/tsd_products_support_series_home.html">http://www.cisco.com/en/US/products/ps6178/tsd_products_support_series_home.html</a>
	Cisco Unified Application Environment	<a href="http://www.cisco.com/en/US/products/ps7058/tsd_products_support_series_home.html">http://www.cisco.com/en/US/products/ps7058/tsd_products_support_series_home.html</a>
	Cisco Unified PhoneProxy	<a href="http://www.cisco.com/en/US/products/ps7057/tsd_products_support_series_home.html">http://www.cisco.com/en/US/products/ps7057/tsd_products_support_series_home.html</a>
Conferencing	Cisco Unified MeetingPlace	<a href="http://www.cisco.com/en/US/products/sw/ps5664/ps5669/tsd_products_support_series_home.html">http://www.cisco.com/en/US/products/sw/ps5664/ps5669/tsd_products_support_series_home.html</a>
	Cisco Unified MeetingPlace Express	<a href="http://www.cisco.com/en/US/products/ps6533/tsd_products_support_series_home.html">http://www.cisco.com/en/US/products/ps6533/tsd_products_support_series_home.html</a>
	Cisco Unified Conferencing for TelePresence	<a href="http://www.cisco.com/en/US/products/ps7266/tsd_products_support_series_home.html">http://www.cisco.com/en/US/products/ps7266/tsd_products_support_series_home.html</a>
	Cisco Unified Videoconferencing	<a href="http://www.cisco.com/en/US/products/hw/video/ps1870/tsd_products_support_series_home.html">http://www.cisco.com/en/US/products/hw/video/ps1870/tsd_products_support_series_home.html</a>
Voice Mail and Unified Messaging	Cisco Unity	<a href="http://www.cisco.com/en/US/products/sw/voicesw/ps2237/tsd_products_support_series_home.html">http://www.cisco.com/en/US/products/sw/voicesw/ps2237/tsd_products_support_series_home.html</a>
	Cisco Unity Connection	<a href="http://www.cisco.com/en/US/products/ps6509/tsd_products_support_series_home.html">http://www.cisco.com/en/US/products/ps6509/tsd_products_support_series_home.html</a>
	Cisco Unity Express	<a href="http://www.cisco.com/en/US/products/sw/voicesw/ps5520/tsd_products_support_series_home.html">http://www.cisco.com/en/US/products/sw/voicesw/ps5520/tsd_products_support_series_home.html</a>

**Table 7-2** *Component Resources Documentation (continued)*

Category	Component	Documentation URL
Endpoints and Clients	Cisco Unified IP Phone 7900 Series	<a href="http://www.cisco.com/en/US/products/hw/phones/ps379/tsd_products_support_series_home.html">http://www.cisco.com/en/US/products/hw/phones/ps379/tsd_products_support_series_home.html</a>
	Cisco IP Communicator	<a href="http://www.cisco.com/en/US/products/sw/voicesw/ps5475/tsd_products_support_series_home.html">http://www.cisco.com/en/US/products/sw/voicesw/ps5475/tsd_products_support_series_home.html</a>
	Cisco Unified Personal Communicator	<a href="http://www.cisco.com/en/US/products/ps6844/tsd_products_support_series_home.html">http://www.cisco.com/en/US/products/ps6844/tsd_products_support_series_home.html</a>
	Cisco Unified Video Advantage	<a href="http://www.cisco.com/en/US/products/sw/voicesw/ps5662/tsd_products_support_series_home.html">http://www.cisco.com/en/US/products/sw/voicesw/ps5662/tsd_products_support_series_home.html</a>
Wireless and Mobility	Cisco Aironet 1200 Series Access Points	<a href="http://www.cisco.com/en/US/products/hw/wireless/ps430/tsd_products_support_series_home.html">http://www.cisco.com/en/US/products/hw/wireless/ps430/tsd_products_support_series_home.html</a>
	Cisco Unified Mobility Advantage	<a href="http://www.cisco.com/en/US/products/ps7270/tsd_products_support_series_home.html">http://www.cisco.com/en/US/products/ps7270/tsd_products_support_series_home.html</a>
	Cisco Unified Mobile Communicator	<a href="http://www.cisco.com/en/US/products/ps7271/tsd_products_support_series_home.html">http://www.cisco.com/en/US/products/ps7271/tsd_products_support_series_home.html</a>
Security	Cisco ASA 5500 Series Adaptive Security Appliances	<a href="http://www.cisco.com/en/US/products/ps6120/tsd_products_support_series_home.html">http://www.cisco.com/en/US/products/ps6120/tsd_products_support_series_home.html</a>
	Cisco Catalyst 6500 Series Firewall Services Module (FWSM)	<a href="http://www.cisco.com/en/US/products/hw/modules/ps2706/ps4452/tsd_products_support_model_home.html">http://www.cisco.com/en/US/products/hw/modules/ps2706/ps4452/tsd_products_support_model_home.html</a>
	Cisco Catalyst 6500 Series Intrusion Detection System (IDSM-2) Module	<a href="http://www.cisco.com/en/US/products/hw/modules/ps2706/ps5058/tsd_products_support_model_home.html">http://www.cisco.com/en/US/products/hw/modules/ps2706/ps5058/tsd_products_support_model_home.html</a>
	Cisco Intrusion Prevention System Appliance IPS-4200	<a href="http://www.cisco.com/en/US/products/sw/secursw/ps2113/tsd_products_support_series_home.html">http://www.cisco.com/en/US/products/sw/secursw/ps2113/tsd_products_support_series_home.html</a>
	Cisco NAC Appliance (Clean Access)	<a href="http://www.cisco.com/en/US/products/ps6128/tsd_products_support_series_home.html">http://www.cisco.com/en/US/products/ps6128/tsd_products_support_series_home.html</a>
	Management Center for Cisco Security Agents	<a href="http://www.cisco.com/en/US/products/sw/secursw/ps5057/products_installation_and_configuration_guides_list.html">http://www.cisco.com/en/US/products/sw/secursw/ps5057/products_installation_and_configuration_guides_list.html</a>
	Cisco Security Agents	<a href="http://www.cisco.com/en/US/products/sw/secursw/ps5057/tsd_products_support_series_home.html">http://www.cisco.com/en/US/products/sw/secursw/ps5057/tsd_products_support_series_home.html</a>

**Table 7-2** *Component Resources Documentation (continued)*

<b>Category</b>	<b>Component</b>	<b>Documentation URL</b>
Network Management	Cisco Unified Operations Manager	<a href="http://www.cisco.com/en/US/products/ps6535/tsd_products_support_series_home.html">http://www.cisco.com/en/US/products/ps6535/tsd_products_support_series_home.html</a>
	Cisco Unified Service Monitor	<a href="http://www.cisco.com/en/US/products/ps6536/tsd_products_support_series_home.html">http://www.cisco.com/en/US/products/ps6536/tsd_products_support_series_home.html</a>
	Cisco netManager - Unified Communications	<a href="http://www.cisco.com/en/US/products/ps7243/tsd_products_support_series_home.html">http://www.cisco.com/en/US/products/ps7243/tsd_products_support_series_home.html</a>
	Cisco Unified Service Statistics Manager	<a href="http://www.cisco.com/en/US/products/ps7285/tsd_products_support_series_home.html">http://www.cisco.com/en/US/products/ps7285/tsd_products_support_series_home.html</a>
	Cisco Unified Provisioning Manager	<a href="http://www.cisco.com/en/US/products/ps7125/tsd_products_support_series_home.html">http://www.cisco.com/en/US/products/ps7125/tsd_products_support_series_home.html</a>
	Cisco Monitor Manager	<a href="http://www.cisco.com/en/US/products/ps7244/tsd_products_support_series_home.html">http://www.cisco.com/en/US/products/ps7244/tsd_products_support_series_home.html</a>
	Cisco Monitor Director	<a href="http://www.cisco.com/en/US/products/ps7246/tsd_products_support_series_home.html">http://www.cisco.com/en/US/products/ps7246/tsd_products_support_series_home.html</a>
	CiscoWorks Resource Management Essentials (RME)	<a href="http://www.cisco.com/en/US/products/sw/cscowork/p/s2073/tsd_products_support_series_home.html">http://www.cisco.com/en/US/products/sw/cscowork/p/s2073/tsd_products_support_series_home.html</a>

**Table 7-2** Component Resources Documentation (continued)

Category	Component	Documentation URL
Communications Infrastructure	Cisco IOS Software Release 12.4 T	<a href="http://www.cisco.com/en/US/products/ps6441/tsd_products_support_series_home.html">http://www.cisco.com/en/US/products/ps6441/tsd_products_support_series_home.html</a>
	Cisco 1700 Series Modular Access Routers	<a href="http://www.cisco.com/en/US/products/hw/routers/ps221/tsd_products_support_series_home.html">http://www.cisco.com/en/US/products/hw/routers/ps221/tsd_products_support_series_home.html</a>
	Cisco 2600 Series Routers	<a href="http://www.cisco.com/en/US/products/hw/routers/ps259/tsd_products_support_series_home.html">http://www.cisco.com/en/US/products/hw/routers/ps259/tsd_products_support_series_home.html</a>
	Cisco 2800 Series Routers/Voice Gateways	<a href="http://www.cisco.com/en/US/products/ps5854/tsd_products_support_series_home.html">http://www.cisco.com/en/US/products/ps5854/tsd_products_support_series_home.html</a>
	Cisco 3700 Series Voice Gateways/Gatekeepers	<a href="http://www.cisco.com/en/US/products/hw/routers/ps282/tsd_products_support_series_home.html">http://www.cisco.com/en/US/products/hw/routers/ps282/tsd_products_support_series_home.html</a>
	Cisco 3800 Series Routers/Voice Gateways	<a href="http://www.cisco.com/en/US/products/ps5855/tsd_products_support_series_home.html">http://www.cisco.com/en/US/products/ps5855/tsd_products_support_series_home.html</a>
	Cisco 7200 Series Voice Gateways	<a href="http://www.cisco.com/en/US/products/hw/routers/ps341/tsd_products_support_series_home.html">http://www.cisco.com/en/US/products/hw/routers/ps341/tsd_products_support_series_home.html</a>
	Cisco IP-to-IP Gateways	<a href="http://www.cisco.com/en/US/products/sw/voicesw/ps5640/tsd_products_support_series_home.html">http://www.cisco.com/en/US/products/sw/voicesw/ps5640/tsd_products_support_series_home.html</a>
	Cisco Catalyst 3550 Series Access Switches	<a href="http://www.cisco.com/en/US/products/hw/switches/ps646/tsd_products_support_series_home.html">http://www.cisco.com/en/US/products/hw/switches/ps646/tsd_products_support_series_home.html</a>
	Cisco Catalyst 3560 Series Access Switches	<a href="http://www.cisco.com/en/US/products/hw/switches/ps5528/tsd_products_support_series_home.html">http://www.cisco.com/en/US/products/hw/switches/ps5528/tsd_products_support_series_home.html</a>
	Cisco Catalyst 3750 Series Data Center Switches	<a href="http://www.cisco.com/en/US/products/hw/switches/ps5023/tsd_products_support_series_home.html">http://www.cisco.com/en/US/products/hw/switches/ps5023/tsd_products_support_series_home.html</a>
	Cisco Catalyst 4500 Series Access Switches	<a href="http://www.cisco.com/en/US/products/hw/switches/ps4324/tsd_products_support_series_home.html">http://www.cisco.com/en/US/products/hw/switches/ps4324/tsd_products_support_series_home.html</a>
	Cisco Catalyst 6500 Series Switches	<a href="http://www.cisco.com/en/US/products/hw/switches/ps708/tsd_products_support_series_home.html">http://www.cisco.com/en/US/products/hw/switches/ps708/tsd_products_support_series_home.html</a>
	Cisco Catalyst 6600 Series Voice Gateways	<a href="http://www.cisco.com/en/US/products/hw/switches/ps700/tsd_products_support_eol_series_home.html">http://www.cisco.com/en/US/products/hw/switches/ps700/tsd_products_support_eol_series_home.html</a>
	Cisco VG224/248 Analog Voice Gateways	<a href="http://www.cisco.com/en/US/products/hw/gatecont/ps2250/tsd_products_support_series_home.html">http://www.cisco.com/en/US/products/hw/gatecont/ps2250/tsd_products_support_series_home.html</a>
Cisco ATA 186,188 (analog telephone adaptor)	<a href="http://www.cisco.com/en/US/products/hw/gatecont/ps514/tsd_products_support_series_home.html">http://www.cisco.com/en/US/products/hw/gatecont/ps514/tsd_products_support_series_home.html</a>	

## Configuration Command Files

You can download sample configuration files from [Table 7-3](#) for the components described in the [Component Reference Configurations](#) topic in the Implement tab.

Table 7-3 Configuration Command Files

Description	Filename
<p>Zip file includes Cisco device configurations listed below:</p> <p><b>Note</b> Some parameters, such as passwords, have been removed from the configuration files for security reasons.</p>	<p><a href="#">IPT_UC601_Reference_Configs.zip</a> (right-click to download zip) includes the files below.</p> <p><b>Note</b> 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.</p>
Cisco Unified Communications Manager Express on a Cisco 3845 (ALT-CME-3845-3)	ATL_3845.txt
Cisco Unified Communications Manager Express on a Cisco 2651 (YYZ-CME-3745-1)	YYZ_Config.txt
Cisco Unified Communications Manager Express on a Cisco 3725 with SIP and SCCP configured (Covington-3725-CME)	Covington-SIP-SCCP.txt
Cisco Unified Communications Manager Express on a Cisco 2801 with SIP configured (Ely-2801-CME)	ELY-PureSIP.txt
Cisco Unified Communications Manager Express on a Cisco 2801 with SCCP configured (Robins-2801-GW)	Robins-PureSCCP.txt
Cisco Unity Express on a Cisco 3745 (YYZ-CUE-3745)	CUE_3745_Config.txt
Cisco Catalyst switch Firewall Service Module (SJC-RFD-FWSM-1)	FWSM_Config.txt
Cisco 3745 primary gatekeeper (SJC-RFD-GK-1)	Gatekeeper_Primary_Config.txt
Cisco 3745 alternate gatekeeper (SJC-RFD-GK-2)	Gatekeeper_Alternate_Config.txt
Gatekeeper configured as first gatekeeper in a cluster (SJC-RFD-VID-GK-1)	Gatekeeper_FirstinCluster_Config.txt
Gatekeeper configured as second gatekeeper in a cluster (SJC-VIDEO-GK-2)	Gatekeeper_SecondinCluster_Config.txt
IP-IP gateway configured for Cisco Unified Communications Manager to IP-IP gateway SIP trunks (ATL-IPIPGW)	ATL-IPIPGW.txt
Inter-cluster calls from Cisco Unified Communications Manager Express to Cisco Communications Manager via IP-IP gateway (Robins-IPIP-GW)	Robins-IPIPGW-config.txt
Cisco 3745 SIP gateway (DFW-3745GW)	SIPGW_3745_Config.txt
Cisco Catalyst 6500 switch (CDG_CMM-GW_1) configured for QSIG links	QSIG_Cat6500_Config.txt
Cisco Unified SRST for H.323 gateway on a Cisco 2851 (HNL1-SRST-2851)	hnl1-srst-2581-config.txt
Cisco Unified SRST for MGCP gateway on a Cisco 2691 (HNL2-SRST-2691)	hnl2-srst-2691-config.txt
Cisco Aironet WLAN Controller	wlan-controller.txt

# System Test Results

This topic summarizes the results of Cisco Unified Communications Release 6.0(1) system testing for IP telephony environments. This topic contains the following sections:

- [Testing Objectives](#)
- [Tested Deployment and Site Models](#)
- [Test Results](#)

## Testing Objectives

Cisco Systems validates Cisco Unified Communications 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.

Testing performed for Cisco Unified Communications 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

## Tested Deployment and Site Models


Cisco Unified Communications Release 6.0(1) testing for IP telephony was designed to test the hardware and software components that work together in a multi-site distributed IP telephony 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 Cisco Unified Communications Release 6.0(1), see [Tested Deployments and Site Models](#).

## Test Results

The results of the system tests performed for IP telephony during Cisco Unified Communications Release 6.0(1) are shown in the [System Test Results](#) (right-click to download PDF).

The test results contain the following information:

- **Title**—Title of the test.

- ID—Identifier for the test.
- Description—Description of the purpose of the test.
- Features Tested—Component feature tested.
- 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://www.cisco.com/cgi-bin/Support/Bugtool/launch\\_bugtool.pl](http://www.cisco.com/cgi-bin/Support/Bugtool/launch_bugtool.pl) 

## 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](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 box.

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

## Cisco Unified Communications System Demo

The Cisco Unified Communications system demonstration document is for Cisco sales teams and describes the various methods available to demonstrate the Cisco Unified Communications System.

- [Cisco Unified Communications System Demo \(INTERNAL\)](#)



## CHAPTER 8

# Training Library

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## Using the Training Library

On this tab you can find 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 and downloadable VODs.

## General Training

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

- [Cisco Learning Connection](#)
- [Cisco Unified Communications Simulation Challenge](#)
- [Global Learning Partner Locator](#)

## Quick Learning Modules

Quick learning modules (QLMs) are short e-learning modules that discuss and describe various aspects of Unified Communications systems in 15- to 20-minute timeframes.

View the following QLMs for information on the Cisco Unified Communications system:

- [Cisco Unified Communications System Overview](#)  
This module describes the system release approach, system components, PPDIIO lifecycle, pricing and packaging, and deployment models.
- [Cisco Unified Communications Installing and Upgrading](#)  
This module includes information on the reference architectures, upgrade strategies and planning upgrade steps, and functionality changes that result from an upgrade to Release 5.1(1).

## Modules for the Prepare and Plan Phase

View these e-learning modules for general training on planning Cisco Unified Communications systems. If you do not already have a guest password, you will be prompted to create one.

- [Unified Communications System Overview](#)

This module describes the system release approach. It presents the system components at a high level; describes system bundles, pricing, and services; and outlines the deployment models and migration strategies.

- [Unified Communications System Architecture](#)

These videos describe the purposes and uses of the system architecture components. It details the SRND-recommended deployment models and describes the changes to the deployment models for Cisco Unified CallManager and Cisco Unity. It also covers security and network management recommendations.

- [Part 1: Unified Communications Architecture](#)
- [Part 2: Contact Center Architecture](#)

## Videos for the Implementation Phase

View these videos for general training on implementing Cisco Unified Communications systems.

- [Unified Communications System Install and Upgrade](#)

This group of videos summarizes the system components and illustrates the uses of the reference architectures. They describe preparing and planning for an upgrade; an outline of the upgrade process; and recommendations for efficient upgrading. They also identify functionality changes and special application integration notes.

## Training Available to Partners

Cisco offers a variety of training resources to partners. See these Cisco training websites for training on all Cisco products and technologies:

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

## Partner E-Learning Connection Courses

Use the following e-learning modules for information on the Cisco Unified Communications system:

- [Cisco Unified Communications System Overview](#) 

This module describes the system release approach, system components, system bundles, deployment models, and new Cisco Unified Communications 5.1(1) features.

- [Cisco Unified Communications System Installation and Upgrade](#) 

This module describes the system install and upgrade requirements, process, and best practices.

- [Cisco Unified Communications Pricing and Ordering](#) 

This module describes the pricing and ordering methodology, bundles, software subscription model, and how to create a basic design using the Solution Expert application.

## Quick Learning Modules

Quick learning modules (QLMs) are short e-learning modules that discuss and describe various aspects of Unified Communications systems in 15- to 30-minute timeframes.

View the following QLMs for information on the Cisco Unified Communications system:

- [Cisco Unified Communications System Overview](#)  
This module describes the system release approach, system components, PPDIIO lifecycle, pricing and packaging, and deployment models.
- [Cisco Unified Communications Installing and Upgrading](#)  
This module includes information on the reference architectures, upgrade strategies and planning upgrade steps, and functionality changes that result from an upgrade to Release 5.1(1).

## Cisco Learning Partner Courses

Cisco Learning Partners, Cisco Learning Solutions Partners, and their sponsored organizations are the authorized commercial source for Cisco training. These courses are created by Cisco product teams and certified Cisco instructors. They are available in instructor-led or live e-learning lab-based formats as well as custom online learning options. For a list of Cisco Unified Communications and other related courses, see the following URL:

[http://www.cisco.com/web/learning/le31/le29/learning\\_recommended\\_training0900aecd800d8552.html](http://www.cisco.com/web/learning/le31/le29/learning_recommended_training0900aecd800d8552.html)

## 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

- [Cisco Unified Communications ASPIRE!™ Workshop](#)  
This workshop is designed for account managers, product sales specialists, systems engineers, and sales management personnel who want to understand how to better position the business value of the Cisco Unified Communications release and its new capabilities with an executive-level audience outside the IT organization. Click the course name above for a full course description and information on how to register.
- [Cisco Unified Communications WIIFY!™ Workshop](#)  
This workshop is designed for account managers, product sales specialists, systems engineers, and sales management personnel who have previously participated in the two-day Cisco Unified Communications ASPIRE!™ Workshop and who would like to reinforce those consultative selling concepts in the context of the new capabilities delivered as part of the Cisco Unified Communications release. Click the course name above for a full course description and information on how to register.

### ANI Cisco Unified Communications Courses

- [Cisco Unified Communications Deep Dive Application Selling](#)

The challenge for the Cisco and partner account teams is to understand the relationship between technology solutions, business processes, and keys to customer business success. The Cisco Unified Communications portfolio provides structure and intelligence to business communications, enabling organizations to streamline and integrate their communications more closely with business processes, making them more competitive in their market. Cisco Unified Communications Deep Dive Application Selling teaches the account manager how to become the critical link between customer issues and Cisco solutions by recognizing the critical success factors of customer stakeholders and relating the Cisco Unified Communications solutions to the achievement of these factors. Click the course name above for a full course description and information on how to register.

- [Unified Communications Advanced Selling](#)

While knowledge of the technical aspects, features, and functions of products is important, positioning the business benefits of solutions is what really wins campaigns. Cisco Unified Communications Advanced Selling takes the account manager from technical knowledge to effective positioning and business application. The course leverages the account manager's existing understanding of the Cisco IP telephony portfolio to position Cisco Unified Communications as a compelling differentiator essential to businesses as they confront the business challenges of today and well into the future. Click the course name above for a full course description and information on how to register.

## Training Videos for Cisco Unified Communications System


For a list of training and VODs, see the following URL. These training videos require a partner login.

[http://www.cisco.com/web/partners/sell/technology/ipc/announcements/unified\\_communications\\_system\\_6\\_launch.html#training](http://www.cisco.com/web/partners/sell/technology/ipc/announcements/unified_communications_system_6_launch.html#training)

## Training Available to Cisco Employees

Cisco offers a variety of training resources to employees. These Cisco training websites provide training on all Cisco products and technologies:

- [Partner E-Learning Connection](#)
- [Learning Locator Course List](#)

The [Unified Communications System Launch](#)  page contains links to numerous learning resources and VODs



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