Cisco Collaboration Systems for Contact Center Release 10.5(1)

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Home

Welcome to Cisco Collaboration Systems Contact Center Technical Information Site

This information site describes the Cisco Collaboration Systems Release 10.5(1) contact center, the Cisco IP solution for distributed contact center applications. The contact center system is an integral part of the Cisco Collaboration solution. Cisco Collaboration products provide enterprise-class solutions that integrate data and voice over converged networks.

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

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

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

The Critical Path to Successful Deployment

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

Audience

This technical information site is designed for people who are implementing the Cisco Collaboration Systems:

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

About This Release

This documentation covers Cisco Collaboration Systems applications through Release 10.5(1). If you are upgrading an existing Cisco Collaboration Systems application, begin by reading the System Release Notes for Contact Center: Cisco Unified Communications System, Release 10.5(1) to familiarize yourself with functionality in this new release.

There are two technical information sites for Cisco Collaboration Systems Release 10.5(1). this site for for contact center systems, and the site for Collaboration System Release Notes for Cisco Collaboration Systems Release 10.5(1).

Using This Information System

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

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

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

About the Technical Information Site Window

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

Figure 1-1 shows an example of a window for a Cisco Collaboration Systems solution. Table 1-1 describes the numbered window elements.

Figure 1-1   Example of Technical Information Site Window

Table 1-1   Key to Window Illustration

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

Table 1-1   Key to Window Illustration (continued)

| 5 | Main heading in a TOC, such as "Introduction to Plan." A blue heading links to a topic in the content pane. A black heading is unlinked and simply a title for linked subtopics below.

A highlighted heading in the TOC indicates the current topic displayed in the content pane. | 6 | Content pane, where the information resides. Two kinds of links in the content pane are:

• A link to another topic in the content pane looks like an ordinary link. Clicking the link switches the contents of the pane.

• A link to a secondary topic is appended with a popup icon ⬀. Clicking the link opens a new browser window, offset from the current window. If the other window is already open, the topic replaces the current contents. |
| 7 | Download an Adobe Acrobat PDF of the content of the current tab or the content of the entire site. | 8 | GIVE US FEEDBACK: Click to go the Feedback form at the bottom of the page to provide page-specific feedback. |

Types of Topics

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

• "Doing" topics, such as "Performing a System Upgrade," are *task topics*, and provide instructions for doing something.

• "Overview" or "About" topics are *concept topics* to help you understand and plan your deployment and carry out tasks knowledgeably.

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

Site Index

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

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

Visio diagrams, 1, 2

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

## Graphics with Hotspots and Popup Text (Image Maps)

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

Where Information Is Located

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

- Overviews and high-level process and procedure information specific to your solution or system are included directly in the information site.

- Product and technology overviews, detailed requirements, task details, and other more generic topics are located outside the site. These topics have the appearance of standard Cisco documentation with which you may already be familiar. Links to these topics appear with a popup icon ⬓ appended, for example, Performing Your System Installation ⬓. Clicking the link opens the topic in a new, secondary browser window offset from the current window, rather than replacing the current topic in the content pane. You can click the link to view the information when you need it, and then return to your place in the information site.

- Links with this symbol (🔒) are available only to people with a Cisco sign in, such as Cisco partners or registered Cisco.com users with a Cisco service contract. After clicking the link, sign in when prompted. A secondary browser window opens. Keep the secondary window open in order to open other links without having to sign in again.

- Links with **[Internal]** are available only to Cisco employees.

About the Secondary Browser Window

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

Tips on Navigating the Information Site

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

Cisco Documentation

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

http://www.cisco.com/c/en/us/td/docs/general/whatsnew/whatsnew.html

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

Site Content Map

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

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

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Prepare

Introduction to Prepare

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

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

Before You Begin

Understand the features and functions of contact center applications. Start with the high-level information in the Cisco Collaboration Systems Features and Benefits Overview and the Contact Center Overview, and then proceed to the more detailed and release-specific information in the System Release Notes for Contact Center: Cisco Collaboration Systems Release 10.5(1).

When You Are Done

You have defined and created the following:

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

Major Concepts and Tasks In This Process

- Cisco Collaboration Systems Features and Benefits Overview
- Contact Center Overview

Cisco Collaboration Systems Features and Benefits Overview

For details about this Cisco Collaboration Systems, see Cisco Collaboration System Description Release 10.5(1).

Contact Center Overview

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

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

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

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

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

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

Cisco Collaboration endpoints range from IP phones to web, mobile, and desktop clients, and deliver voice and video across devices and intelligently connect to the cloud.

TelePresence Video Communication Server Expressway (Cisco VCS) works transparently with Unified CM to provide rich telepresence services, and also supports on-premises and cloud applications, as well as interoperability with third-party unified communications, IP telephony networks, and VoIP systems. The Cisco TelePresence EX Series is an all-in-one tool that streamlines the desktop so you can fluidly move from individual work on your laptop, to a quick video call with a colleague, to problem-solving over shared spreadsheets.

With voice self-service solutions, including Cisco Unified Customer Voice Portal (Unified CVP), and Cisco Unified Contact Center Express (Unified CCX), many calls do not require agent assistance. The open architecture of Unified CVP allows callers to access content also used in web-based interactions, resulting in a consistent customer experience, regardless of the self-service media channel.

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

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

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

- Cisco Unified Communications Manager (Unified Communications Manager) for call routing

- Cisco Unified Intelligent Contact Management Enterprise (Unified ICME) software for contact center routing and agent management
- Cisco Unified IP Integrated Voice Response (Unified IP IVR) or Cisco Unified Customer Voice Portal (Unified CVP) for queuing and self-service
- Cisco Unified Border Element for session border controller (SBC), providing voice and video connectivity from the enterprise IP network to Service Provider SIP trunks
- Cisco Finesse agent and supervisor desktop
- Jabber iOS is a Unified Communications application that provides instant messaging (IM), video and voice calling, corporate directory search, presence, and voicemail for iPhone and iPad
- Cisco Jabber Guest, a website or mobile application for instant-on, real-time voice and video
- Jabber for Windows for highly secure, clear, and reliable communications
- Prime Collaboration Provisioning, Assurance, and Deployment to accelerate site rollouts and ongoing maintenance, lower operating expenses, and help ensure a world-class quality of experience
- Cisco Prime License Mmanager for an easy-to-use interface, that automates software activation workflows, and scales for large network deployments
- Cisco Agent Desktop (CAD) or Computer Telephony Integration Object Server (CTI OS) for agent desktop software
- Unified Intelligence Center for web-based reporting and administration
- Cisco MediaSense for media recording capabilities
- Cisco SocialMiner to respond to customers using the same social network, such as Twitter, Facebook, and other public forums or blogging sites
- Cisco Unified IP Phones
- Cisco gateways and gatekeepers
- Cisco LAN/WAN infrastructure and components
- Cisco security components
- Network management tools
- Video components and terminating devices

For more information on contact center features, go to System Features in This Release.

Contact Center Deployment Models

A Cisco Collaboration Systems contact center system supports the deployment models in Table 2-1.

Table 2-1   Contact Center Deployment Models

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

System Features in This Release

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

For detailed contact center feature information, see System Release Notes for Contact Center: Cisco Collaboration Systems Release 10.5(1). For configuration options, see Release Notes for Cisco Unified Contact Center Enterprise Release 10.5(1) and Cisco Unified Contact Center Express Release Notes 10.5(1).

Base Components and Applications

The contact center includes these software components:

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

- Cisco Unified Contact Center Enterprise (Unified CCE)—Creates an IP-based contact management solution that provides intelligent call routing, network-to-desktop CTI, and multimedia contact management.

- Cisco Unified Contact Center Express (Unified CCX)—Provides a multimedia (voice, data, and web), IP-enabled customer-care application environment that enhances the efficiency of contact centers. It provides an Integrated Automatic Call Distribution (ACD), Unified IP IVR, and Computer Telephony Integration (CTI) virtual contact center solution with support for up to 300 agents and 300 Unified ports.

- Cisco TelePresence Video Communication Server (Cisco TelePresence VCS)—The Cisco TelePresence VCS extends face-to-face video collaboration across organizations, and to remote workers and mobile users, by supporting any-to-any video and telepresence communications.

- Cisco TelePresence Video Communication Server Expressway—Cisco VCS Expressway works transparently with Unified CM to provide rich telepresence services to organizations. Cisco VCS supports on-premises and cloud applications, offers interoperability with third-party unified communications, IP telephony networks, and VoIP systems.

- Cisco TelePresence MCU—Designed for the mission-critical communication needs of large enterprises

- Cisco Agent Desktop (CAD)—Provides productivity tools for agents and supervisors. Allows supervisors to view agent states and call information and to send text messages to agents, record conversations, and provide advanced monitoring functions.

- Computer Telephony Integration Object Server (CTI OS)—Combines a powerful, feature-rich server and an object-oriented software development toolkit to enable rapid development and deployment of complex CTI applications.

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

- Cisco Unified IP IVR—Automates access to account information or user-directed call routing by processing user commands through touch-tone input or speech-recognition technologies. Unified IP IVR helps customers who are calling the contact center use voice commands to retrieve the information that they require without ever speaking with an agent, or to quickly navigate to a customer service agent who can help them the first time.

- Cisco Unified Customer Voice Portal (Unified CVP)—Integrates time-division multiplexing (TDM) with IP-based contact centers to provide audio and video call management and call treatment functions. Unified CVP includes a self-service IVR option that can use information that is available to customers on the corporate web server. With support for automated speech recognition (ASR) and text-to-speech (TTS) and self-service capabilities, callers can obtain personalized answers to complex questions and conduct business without the cost of interacting with a live agent.

Additional Product Information

- Cisco Unified Customer Contact Solutions
- Cisco Unified Contact Center Enterprise

Additional Sites and Services

Steps to Success is a Cisco methodology that outlines the tasks required to complete a successful customer engagement. Registered users can visit the Steps to Success 🔒 resource site for Cisco Collaboration process flows.

Cisco Collaboration Systems 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 Services for Unified Communications site.

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Plan

Introduction to Plan

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

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

Before You Begin

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

When You Are Done

You have defined and created the following:

- A comprehensive list of components and applications that match the requirements

- A project plan based on those requirements including a proposed, high-level design

Major Concepts and Tasks in This Process

- Planning Concepts

- Planning Tasks

- Sample Business System Test Beds

Planning Concepts

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

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

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

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

The concepts that you should review are as follows:

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

Deployment Types

The deployment types to consider are as follows:

- New installation
  - Greenfield—Completely new installation of the Cisco Collaboration system, using no existing equipment.
  - Legacy—New installation of the Cisco Collaboration 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 Collaboration system, which requires an upgrade and migration from a previous system release to the current system release.
- Single-Stage Upgrade
  - Using existing hardware—All components in the network start at the base release set and all components can be upgraded to the target release set within a single maintenance window.
  - Using new hardware (flash-cut or shrink-and-grow)—A parallel network should be built using new hardware and pre-staged with configuration to support the existing production network.
- Multistage System Upgrade
  - Using existing hardware (hybrid system)—The components in individual sites can be upgraded from the base release set to the target release set in stages, during separate maintenance windows.
- Multisite Migration with Independent Site Upgrade

– Using a hybrid network with interworking release sets—Components are upgraded on a site-by-site basis during separate maintenance windows. At the completion of each maintenance window, a hybrid network exists within the multiple sites that have components operating on the base release set; or components that are operating on the target release set; or components that are a hybrid system.

Cost of Ownership

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

- Environmental consideration—Include the location of hosts, servers, terminals, and other end nodes; the projected traffic for the environment; and the projected costs for delivering different service levels.

- Performance constraints—Consider network reliability, traffic throughput, and host and client computer speeds. For example, network interface cards and hard drive access speeds.

- Internetworking variables—Include the network topology, line capacities, packet flow assignments, redundancy and fault tolerance factors, backward compatibility (co-existence and interoperability), and security.

Redundancy

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

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

For more information on redundancy planning, see the Redundancy and Load Sharing Design Guide.

Capacity and QoS

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

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

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

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

For more information on QoS, see the Enterprise QoS Solution Reference Network Design Guide.

Security

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

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

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

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

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

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

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

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

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

- Security Products and Solutions
- Secure Unified Communications
- Cisco Support Community for Security

Sample Business System Test Beds

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

Use System Test Beds to Define Your Business Requirements

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

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

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

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

Test Beds

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

- Test Bed 1 Unified CCE site description
- Test Bed 2 Unfied CCX site description

Call Flow Models

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

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

Understand Your Call Flows

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

Planning Tasks

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

- Determine Your Business Requirements
- Use Planning Tools and Templates
- Understand Your Deployment Options
- Identify System Components
- Collect and Analyze Data
- Create High-Level Design
- Planning a System Installation
- Planning a System Upgrade

Determine Your Business Requirements

Consider the following factors in your call center:

- Collect requirements
  - Assess user requirements
  - Identify functionality requirements
- Contact center operations
  - Number of sites
  - Agents and types of services
  - Types of calls, call treatment, and call handling

- – Busy hour calls attempts (BHCA) rate
- Call flows
- Installation and upgrade requirements
    - – Installation and configuration information
    - – Upgrade and migration information

Collecting Requirements

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

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

Call Center Operations

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

Call Flows

See the Understand Your Call Flows topic.

Planning a System Installation

For installation and configuration checklists and documents, see the Installation and Configuration Checklists topic on the Implement tab.

For a list of installation and configuration documents for the software and hardware components that are part of the Cisco Collaboration Systems family of contact center products, see the Component Installation and Configuration Guides topic on the Implement tab.

Planning a System Upgrade

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

Use Planning Tools and Templates

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

Solution Reference Network Design Documents

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

- Cisco Collaboration Communications System SRND Based on Cisco Unified Communications Manager 10.x
- Cisco Unified Communications SRND Based on Cisco Unified Communications Manager 9.x
- Cisco Unified Communications SRND Based on Cisco Unified Communications Manager 8.x
- Cisco Unified Communications SRND Based on Cisco Unified Communications Manager 7.x
- Cisco Unified Communications SRND Based on Cisco Unified Communications Manager 6.x
- Cisco Unified Contact Center Enterprise SRND Release 9.x
- Cisco Unified Contact Center Enterprise SRND Release 8.x
- Cisco Unified Contact Center Enterprise SRND Release 7.x
- Cisco Unified Contact Center Express SRND Release 9.0
- Cisco Unified Contact Center Express SRND Release 8.5(1)
- Cisco Unified Contact Center Express SRND Release 7.0
- Cisco Unified Customer Voice Portal (CVP) 9.x SRND
- Cisco Unified Customer Voice Portal (CVP) 8.5(x) SRND
- Cisco Unified Customer Voice Portal (CVP) 8.x SRND
- Solution Reference Network Design for Cisco MediaSense Release 8.5(4)
- Cisco Unified Intelligence Center Solution Reference Network Design (SRND)
- Enterprise QoS System Reference Network Design

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

Ordering Guides

Ordering guides 🔒 for most Cisco Collaboration Systems products are available for Cisco partners, Cisco sales staff, and Cisco service providers.

Understand Your Deployment Options

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

- Single site—In this model, all the voice gateways, agents, desktops, IP Phones, and call processing servers such as Unified Communications Manager, Unified ICM, and Customer Response Solutions (CRS) and/or Unified CVP are located at the same site and have no WAN connectivity between any contact center software modules.

- Multisite centralized—In the multisite WAN model with centralized call processing, the Unified Communications Manager cluster resides at a central (or hub) campus and communication with remote offices occurs over the IP WAN. The central site or data center provides the call processing services and acts as the hub for the remote sites. This model also contains distributed voice gateways for locally dialed calls.

- Multisite WAN distributed—In the multisite WAN model with distributed call processing, typically some sites have their own Unified Communications Manager cluster and are interconnected with intercluster trunks (ICT Trunking). Similar to the multisite centralized model, sites in the multisite WAN distributed model are deployed with distributed voice gateways. Communication between sites occurs over the IP WAN.

- Clustering over WAN—In the Clustering over WAN (CoW) model, a single Unified Communications Manager cluster with its subscriber servers and Unified CCE components are split across multiple sites connected via a QoS-enabled WAN.

See also the Sample Business System Test Beds topic.

Identify System Components

For a brief description of all the components that are available with Cisco Collaboration, see the System Components chapter in the *Cisco Collaboration Systems Description*.

The Component Installation and Configuration Guides topic links to information that describes components that are specific to the contact center.

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

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

- Hardware and System Software Specification (Bill of Materials) for Cisco Unified ICM/Unified CC Enterprise & Hosted Editions—Specifies the hardware and system software compatible with and required for Cisco Unified ICM and Cisco Unified Contact Center.

- Hardware and System Software Specification for Cisco Unified Customer Voice Portal—Provides platform hardware specifications and compatible third-party software version requirements across the major components of the Cisco Unified CVP solution.

- Hardware and System Software Specification (Bill of Materials) for Cisco Unified Intelligence Center—Specifies the hardware and software that have been qualified by Cisco Quality Assurance for use with Cisco Unified Intelligence Center (Unified IC).

Collect and Analyze Data

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

- Perform an infrastructure analysis—Obtain floor plans and campus maps, including utilities and conduit systems, to identify deficiencies in infrastructure.

- Perform a software gap analysis—Do a software gap analysis to address network management tools for the IP network.

- Perform an initial traffic analysis—Collect data on all potential converged infrastructure traffic flows. Use station message detail recording (SMDR) and billing records to determine legacy call volumes and use network management tools to collect key statistics on your IP data network.

Create High-Level Design

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

The Understand Your Call Flows topic shows you how to use call flow data for your design.

Preparing for Your System Installation

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

This topic contains the following sections:

- Software Version Matrix
- Critical Caveats

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

Preparing for Your System Upgrade

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

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

This topic contains the following sections:

- Software Version Matrix

- Critical Caveats

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

Additional Sites and Services

Steps to Success is a Cisco methodology that outlines the tasks required to complete a successful customer engagement. Registered users can visit the Steps to Success 🔒 resource site for Cisco Collaboration 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 Services for Unified Communications site.

Cisco Unified Communications System Demos

Tools are available to demonstrate the collaboration features of a Cisco Collaboration system:

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

4

Design

Introduction to Design

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

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

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

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

Before You Begin

Review information about the Cisco Validated Design and Preferred Architecture. Cisco Validated Designs consist of systems and solutions that are designed, tested, and documented to facilitate and improve customer deployments.

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

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

When You Are Done

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

- Deployment models that you can use at your site (see Review Tested Deployment Models)
- Network diagrams (see Network Topology Diagrams in the Resource Library for editable Microsoft Visio network drawings)

- Routing strategy
- Redundancy
- Call flows
- Traffic flows
- Equipment list
- Bill of materials

Major Concepts and Tasks in This Process

- Design Concepts
- Design Tasks

Design Concepts

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

- Using SRND Documents
- Using Design Tools and Templates

Using SRND Documents

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

The following SRNDs are recommended for designing Cisco Collaboration systems:

- Cisco Collaboration Communications System SRND Based on Cisco Unified Communications Manager 10.x
- Cisco Unified Communications SRND Based on Cisco Unified Communications Manager 9.x
- Cisco Unified Communications SRND Based on Cisco Unified Communications Manager 8.x
- Cisco Unified Communications SRND Based on Cisco Unified Communications Manager 7.x
- Cisco Unified Communications SRND Based on Cisco Unified Communications Manager 6.x
- Cisco Unified Contact Center Enterprise SRND Release 9.x
- Cisco Unified Contact Center Enterprise SRND Release 8.0
- Cisco Unified Contact Center Enterprise SRND Release 7.x
- Cisco Unified Contact Center Express SRND Release 9.0
- Cisco Unified Contact Center Express SRND Release 8.5(1)
- Cisco Unified Contact Center Express SRND Release 7.0
- Cisco Unified Customer Voice Portal (CVP) 9.x SRND
- Cisco Unified Customer Voice Portal (CVP) 8.5(x) SRND
- Cisco Unified Customer Voice Portal (CVP) 8.x SRND
- Solution Reference Network Design for Cisco MediaSense Release 8.5(4)

- Cisco Unified Intelligence Center Solution Reference Network Design (SRND)
- Enterprise QoS System Reference Network Design

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

Using Design Tools and Templates

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

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

- Cisco Collaboration Sizing Tool 🔒

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

  The output from the Cisco Collaboration Sizing Tool includes the count and size mix of Virtual Machines, which can be used with the Cisco Collaboration Virtual Machine Placement Tool.

- Cisco Collaboration Virtual Machine Placement Tool

  A web-based tool that assists users determine the placement of virtual machines and the hardware design for virtualized Collaboration solutions.

  The tool requires the user to have sized the applications and know which Virtual Machines and how many are to be used. So use the Cisco Collaboration Sizing Tool before you use the Cisco Collaboration Virtual Machine Placement Tool.

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

Design Tasks

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

- Identify the Components That You Need
- Review Tested Deployment Models
- Review System Caveats

- Develop Traffic Engineering Specifications
- Define Security Policies
- Additional Sites and Services

Identify the Components That You Need

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

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

Ordering Tools

- Ordering guides 🔒 for most Cisco Collaboration Systems products for Cisco partners, Cisco sales staff, and service providers
- Cisco Unified Contact Center Express Ordering tool 🔒

Review Tested Deployment Models

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

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

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

- Test Bed1, which is designed to replicate a 4000 agent inbound and outbound contact center in multiple sites where agents are located locally, as well as in remote sites and Cisco Unified Customer Voice Portal (Unified CVP) provides call handling and call treatment functions.

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

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

Topic	Description
Test Bed 1: Unified CCE Test Bed 2: Unified CCX	Provides components, topologies, and site definitions for the Unified CCE and Unified CCX deployments that were tested.

Review System Caveats

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

Develop Traffic Engineering Specifications

- Traffic Analysis for Voice over IP—Provides background information on various traffic analysis concepts and features that are applicable to Voice over IP (VoIP). This document presents fundamental traffic theory, several statistical traffic models, application of traffic analysis to VoIP networks, and an end-to-end traffic analysis example.

- Bandwidth Calculators —The following tools are available to calculate bandwidth for contact center systems.
    - Cisco Agent Desktop (CAD)
    - Cisco Unified Intelligence Suite and Intelligence Center Bandwidth Calculator
    - HDS WebView

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

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

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

- VoIP Bandwidth Calculator
- Online Erlang traffic calculators

The Cisco Collaboration Systems 10.x Solution Reference Network Designs (SRND) also includes information on sizing your contact center components.

Define Security Policies

Refer to security policies in these guides:

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

Additional security information is included here for your reference:

- Cisco Self-Defending Network
- Design Zone for Security
- Cisco Security Intelligence Operations

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 Collaboration 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 Services for Unified Communications site.

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

5

Implement

Introduction to Implementation

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

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

Before You Begin

You should understand how to implement Cisco Collaboration Systems. For more information, see Cisco Unified Communications Implementation.

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

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

Your implementation plan should include:

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

When You Are Done

All components are installed and ready to configure.

Major Tasks in This Process

- Order Equipment
- Install and Configure System Components
- Introduction to Troubleshooting

- Conduct User Acceptance Test

Order Equipment

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

Ordering Guides

Ordering guides 🔒 for most Cisco Collaboration Systems products are available for Cisco partners, Cisco sales staff, and Cisco service providers.

Install and Configure System Components

When implementing a new Cisco Collaboration system, create a site-specific installation plan for your team. Describe what needs to be installed and configured. Your plan should reference product-specific installation and configuration guides in Table 5-1.

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.

Planning a System Installation provides guidance for the installation order of components for a Cisco Collaboration Systems Release 10.5(1) contact center deployment. It does not describe installation procedures for individual components. For links to the complete documentation set for each contact center system component, see topic on the Resource Library tab.

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

- Component Installation and Configuration Guides provides a complete list of components and links to related installation and configuration documents.
- Installation and Configuration Checklists provides checklists for installing and configuring some of your contact center components.
- Component Compatibility and Interoperability provides links to information about compatibility between Cisco products and with third-party systems or a hardware platform.

For system configuration examples, as well as other system implementation topics, see the documentation wiki (DocWiki) at:
http://docwiki.cisco.com/wiki/Unified_Communications_System_Implementation

When You Are Done

Components are configured and ready to test:

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

Performing Your System Installation

Before You Begin

See Planning a System Installation to plan your overall strategy.

Install Contact Center Software Components

After you have your installation plan and preparations in place, perform your system installation by following the guidelines and sequence in the individual product installation and configuration guides.

- See Component Resources Documentation for links to component installation and upgrade documents.

Component Installation and Configuration Guides

Table 5-1 provides references to installation and configuration documents for the software and hardware components that are part of the Cisco Collaboration Systems Release 10.5(1) solution. This information includes component names and related documentation.

Table 5-1   *Component Installation and Configuration Documentation*

Product Category	Product Technology	Components	Documentation Title
Call Control	Cisco Unified Communications Manager	• Cisco Unified Communications Manager • Cisco Real-Time Monitoring Tool • Music on Hold • Cisco Security Agent (only as a standalone agent) • Third-party Antivirus	• Install and Upgrade Guides • Configuration Guides • Maintain and Operate
	Cisco TelePresence Video Communication Server	• Cisco TelePresence Video Communication Server • Cisco TelePresence Video Communication Server Expressway	• Install and Upgrade Guides • Configuration Guides • Maintain and Operate

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

Product Category	Product Technology	Components	Documentation Title
Contact Center	Cisco Unified Intelligent Contact Management Enterprise and Unified Contact Center Enterprise	• Cisco Unified Intelligent Contact Management Enterprise • Cisco Unified Contact Center Enterprise • Progger (Peripheral Gateway, CallRouter, and Logger) • Rogger (CallRouter and Logger) • Generic Peripheral Gateway • Cisco Unified Contact Center Gateway Enterprise • Cisco Unified Contact Center System Gateway • Media Routing Peripheral Gateway • CTI Server • Real-Time Admin Workstation (RTAW) • Historical Data Server • Cisco Outbound Option • Cisco Unified Mobile Agent • Cisco Security Agent • Windows 2003 Active Directory • Third-party Antivirus	• Install and Upgrade Guides • Configuration Guides • Maintain and Operate

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

Product Category	Product Technology	Components	Documentation Title
Contact Center	Cisco Unified Customer Voice Portal	• Cisco Unified Customer Voice Portal • Unified CVP Call Servers • Cisco Unified CVP Reporting Server • Cisco Unified CVP Operations Console • HTTP Media Server/Web Server • Cisco Unified Call Studio • Nuance OSR • Nuance OSMS • Cisco Security Agent • Third-party video components • Third-party Antivirus	• Install and Upgrade Guides • Configuration Guides
Contact Center (continued)	Cisco Unified Contact Center Express	• Cisco Unified Contact Center Express • Cisco Agent Desktop • Cisco Agent Desktop—Browser Edition • Cisco Supervisor Desktop • Cisco Desktop Administrator	• Install and Upgrade Guides • Configuration Guides • Maintain and Operate
	Cisco Unified Intelligence Center	Cisco Unified Intelligence Center	• Install and Upgrade Guides • Maintain and Operate
	Cisco MediaSense	Cisco MediaSense	• Install and Upgrade Guides • Configuration Guides
	Cisco Finesse	Cisco Finesse	• Install and Upgrade Guides • Configuration Guides • Maintain and Operate
	Cisco SocialMiner	Cisco SocialMiner	• Maintain and Operate
Server Applications	Cisco Unified Communications Manager IM and Presence Service	Cisco Unified Communications Manager IM and Presence Service	• Install and Upgrade Guides • Configuration Guides • Maintain and Operate

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

Product Category	Product Technology	Components	Documentation Title
Conferencing	Cisco TelePresence MCU	• Cisco TelePresence MCU MSE 8510 • Cisco TelePresence MCU MSE 8510 • Cisco TelePresence MCU MSE 8420	• Install and Upgrade Guides • Configuration Guides • Maintain and Operate
Voice Mail and Unified Messaging	Cisco Unity Connection	Cisco Unity Connection	• Cisco Unity Connection Install and Upgrade Guides • Cisco Unity Connection Configuration Guides • Cisco Unity Connection Maintain and Operate Guides • Cisco Unity Connection End-User Guides
Devices (Endpoints)	Cisco Unified IP Phones 6900 Series	Cisco Unified IP Phones 6921, 6941, 6945, 6961	• Cisco Unified IP Phone 6900 Series End-User Guides • Cisco Unified IP Phone 6900 Series Maintain and Operate Guides
	Cisco IP Phone 7800 Series	Cisco IP Phones 7821, 7841, 7861	• End-User Guides • Maintain and Operate Guides
	Cisco Unified IP Phones 7900 Series	• Cisco Unified IP Phones (SIP) 7970 • Cisco Unified IP Phones (SCCP) 7940, 7960, 7970, • Cisco Unified IP Phone 7921G (Wireless)	• Cisco Unified IP Phone 7900 Series Install and Upgrade Guides • Cisco Unified IP Phone 7900 Series End-User Guides • Cisco Unified IP Phone 7900 Series Maintain and Operate Guides
	Cisco Unified IP Phones 8900 Series	• Cisco Unified IP Phone (SIP) 8961 • Cisco Unified IP Phones 8941, 8945	• Cisco Unified IP Phone 8900 Series Install and Upgrade Guides • Cisco Unified IP Phone 8900 Series End-User Guides • Cisco Unified IP Phone 8900 Series Maintain and Operate Guides

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

Product Category	Product Technology	Components	Documentation Title
Devices (Endpoints)	Cisco Unified IP Phones 9900 Series	Cisco Unified IP Phones (SIP) 9951, 9971	• Cisco Unified IP Phone 9900 Series Install and Upgrade Guides • Cisco Unified IP Phone 9900 Series End-User Guides • Cisco Unified IP Phone 9900 Series Maintain and Operate Guides
	Cisco Desktop Collaboration Experience DX650	Cisco Desktop Collaboration Experience DX600 Series	• End User Guides • Install and Upgrade Guides • Maintain and Operate Guides
	Cisco TelePresence System EX90 and Cisco TelePresence System EX60	• Cisco TelePresence System EX 90 • Cisco TelePresence System EX 60	• Cisco TelePresence System EX Series Install and Upgrade Guides • Maintain and Operate
Client Applications	Cisco Jabber for Windows	Cisco Jabber for Windows	• Install and Upgrade Guides • User Guides • Maintain and Operate Guides
	Cisco Jabber for iOS	Cisco Jabber for iOS	• Install and Upgrade Guides • User Guides • Licensing
	Cisco Jabber Guest	Cisco Jabber Guest	• Jabber Guest
Network Management	Cisco Prime Collaboration Provisioning, Assurance and Deployment	• Cisco Prime Collaboration Provisioning • Cisco Prime Collaboration Assurance • Cisco Prime Collaboration Deployment	• Install and Upgrade • Configure • Maintain and Operate • Cisco Prime Collaboration Deployment Administration Guide
Licensing	Cisco Prime License Manager	Cisco Prime License Manager	• Maintain and Operate

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

Product Category	Product Technology	Components	Documentation Title
Communications Infrastructure	Cisco 3900 Series Routers (Unified CVP VXML, voice/data, SIP, IOS-based Transcoders and Conference Bridges, and Cisco Unified Border Element gateways)	• Cisco 3900 series routers	• Cisco 3900 Series Integrated Services Routers Install and Upgrade Guides • Cisco 3900 Series Integrated Services Routers Configuration Guides • Cisco Unified Border Element Configuration Guides
	Cisco Integrated Services Router (ISR) 2901, 2911, 2921, 2951, 3925, 3945, 3925E, 3945E	• Cisco 2900 Series Integrated Services Routers • Cisco 3900 Series Integrated Services Routers	• Cisco 2900 Series Integrated Services Routers Install and Upgrade Guides • Cisco 2900 Series Integrated Services Routers Configuration Guides • Cisco 3900 Series Integrated Services Routers Install and Upgrade Guides • Cisco 3900 Series Integrated Services Routers Configuration Guides

Installation and Configuration Checklists

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

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

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

Component Compatibility and Interoperability

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

- Cisco Collaboration Systems Compatibility Tool
- Cisco Unified Communications Manager Compatibility Information
- Cisco Unified Contact Center Enterprise Software Compatibility Guide
- Cisco Unified Contact Center Express Software and Hardware Compatibility Guide
- Cisco Interoperability Portal

- Hardware and System Software Specification (Bill of Materials) for Cisco Unified ICM/Contact Center Enterprise & Hosted
- Cisco Unified Communications Manager Server Support Matrix
- Cisco Systems Release Summary Matrix for Contact Center

Software Versions and System Caveats

For specific information on the product software versions used, including system limitations and known caveats, see System Release Notes for Contact Center: Cisco Collaboration Systems Release 10.5(1).

Call Flow Configuration Examples

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

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

Introduction to Troubleshooting

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

- System Troubleshooting Methodology
- Preparing Your Network for Troubleshooting and Recovery

For more information about system-level troubleshooting, see the Cisco Collaboration Systems category on the documentation wiki (DocWiki) at: http://docwiki.cisco.com/wiki/Unified_Communications_System_Troubleshooting

System Troubleshooting Methodology

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

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

Gather Information on the Problem

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

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

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

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

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

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

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

Isolate Point(s) of Failure

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

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

Identify Devices Involved in the Problem

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

- **Network topology diagrams**: It is strongly recommended that you have one or more diagrams that show the arrangement of all Cisco Collaboration Systems 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 Collaboration Systems Release 10.5(1) verification, Cisco Systems has performed interoperability and load testing on simulated network environments running specific software versions. The System Release Notes for Contact Center: Cisco Collaboration Systems Release 10.5(1) lists the combination of software releases that were tested.

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

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

Determine if Network Changes Have Occurred

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

- New agent phones added

- Modifications to Cisco Unified Communications Manager call routing settings, such as new directory numbers, route patterns and dial rules to support new sites or devices

- Changes to port configurations on switches, routers or gateways (new equipment, wiring changes or new port activation)
- Changes to IP addressing schemes (such as adding new subnets) that may have affected route tables

Verify the IP Network Integrity

Always remember that Cisco Collaboration 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 Collaboration 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 Collaboration components involved, you can start applying the many diagnostic tools provided by Cisco components.

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

Table 5-3   *Contact Center Component Troubleshooting Tools and Documentation*

Category	Component	Diagnostic Tools Available	Information Available In...
Call Control	Cisco Unified Communications Manager	Serviceability System tools: - Alarms - Real-Time Monitoring Tool window Trace log files - Communications Manager trace log - SDL trace log (under TAC direction)	- Troubleshooting Guides for Cisco Unified Communications Manager
	Cisco TelePresence Video Communication Server	- Cisco TelePresence Video Communication Server - Cisco TelePresence Video Communication Server Expressway	- Troubleshooting Guides - Troubleshooting TechNotes

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

Category	Component	Diagnostic Tools Available	Information Available In...
Contact Center	Cisco Unified Intelligent Contact Management Enterprise	Distributed Diagnostics and Services Network (DDSN) Support Tools Dashboard (requires additional software)	• Troubleshoot and Alerts
Contact Center (continued)	Cisco Unified Contact Center Enterprise	Log files: • Error/event logs • Agent desktop activity logs • Debugging logs Test programs: • Chat Service • Enterprise Service • IP Phone Agent Service • Packet Capture Driver • Recording and Statistics Service • Voice Over IP Monitor service Sniffing Adapter Update Utility	• Troubleshoot and Alerts • DocWiki: Troubleshooting Tips for Unified CCE • Troubleshooting TechNotes
	Cisco Unified Contact Center Express	Log files Alarms	• Troubleshooting Guides • Troubleshooting TechNotes
Contact Center (continued)	Cisco Unified Customer Voice Portal	Error messages Alarms Support Tools Dashboard (requires additional software)	• Troubleshooting Guides • Cisco Support Tools User Guide for Cisco Unified Software • Troubleshooting TechNotes
	Cisco Unified Intelligence Center	FAQs Troubleshooting Tips	• Troubleshooting TechNotes
	Cisco Finesse	Cisco Finesse	• Troubleshooting TechNotes
	Cisco MediaSense	Log files Alarms	• Troubleshooting Guides
	Cisco SocialMiner	Cisco SocialMiner	• Troubleshoot and Alerts
Server Applications	IM and Presence Service (formerly Cisco Unified Presence)	Configuration Troubleshooter Trace log files Alarms	• Troubleshooting Guides for Cisco Unified Communications Manager

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

Category	Component	Diagnostic Tools Available	Information Available In...
Conferencing	Cisco TelePresence MCU	Cisco TelePresence MCU	• Troubleshooting Guides • Troubleshooting TechNotes
Voice Mail and Unified Messaging	Cisco Unity Connection	Cisco Unity Connection	• Error and System Messages • Password Recovery Procedure for Cisco Unity Connection • Troubleshooting Guides • Troubleshooting TechNotes

Devices (Endpoints)	Cisco Unified IP phones	Network configuration, status and phone model information on Settings menu	• End-User Guides
			   – Cisco Unified IP Phone 6900 Series
			   – Cisco IP Phone 7800 Series
			   – Cisco Unified IP Phone 8900 Series
			   – Cisco Unified IP Phone 9900 Series
			• Cisco Unified IP Phone Administration Guides for Cisco Unified Communications Manager, "Troubleshooting and Maintenance" chapters
			   – Cisco Unified IP Phone 6900 Series
			   – Cisco Unified IP Phone 8900 Series
			   – Cisco Unified IP Phone 9900 Series
			• Error Message Decoder 🔒
			• Output Interpreter 🔒
			• Troubleshooting TechNotes
			   – Cisco IP Phone 7800 Series

	Cisco TelePresence System EX90 and Cisco TelePresence System EX60	• Cisco TelePresence System EX90 • Cisco TelePresence System EX60	• Troubleshooting Guides • Troubleshooting TechNotes
Client Applications	Cisco Jabber for Windows	Cisco Jabber for Windows	• Troubleshooting TechNotes
Network Management	Cisco Prime Collaboration Provisioning, Assurance and Deployment	Cisco Prime Collaboration Provisioning, Assurance and Deployment	• Troubleshooting Guides • Troubleshooting TechNotes

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

Category	Component	Diagnostic Tools Available	Information Available In...
Communications Infrastructure	Cisco 3900 Series Routers	Unified CVP VXML, voice/data, SIP, IOS-based Transcoders and Conference Bridges, and Cisco Unified Border Element gateways	• Troubleshooting Guides
	Cisco Integrated Services Router (ISR)	2901, 2911, 2921, 2951	• Troubleshooting Guides • Troubleshooting TechNotes
	Cisco Unified Border Element Enterprise Edition for Cisco ISR Series	Cisco Unified Border Element Enterprise Edition for Cisco ISR Series	• Troubleshooting TechNotes

Preparing Your Network for Troubleshooting and Recovery

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

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

Network Topology Diagrams

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

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

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

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

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

Figure 5-1   *Contact Center Network Topology Diagram Example*
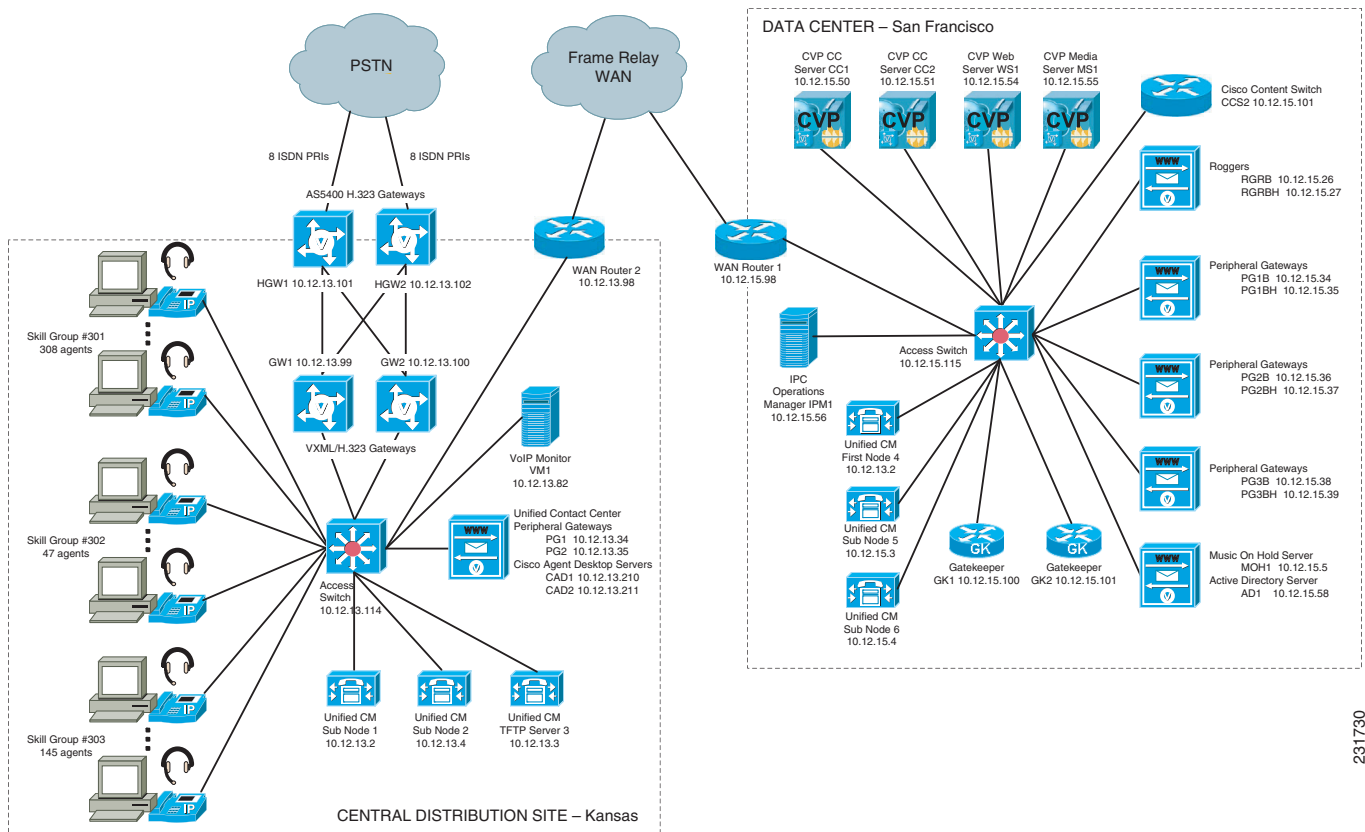
Synchronizing Server Date and Time

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 Using the Cisco IOS Command-Line Interface for details about these IOS commands.

Recommended Trace/Logging Settings

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

Cisco Unified Communications Manager Trace Settings

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

- **Customize trace levels for individual parameters:** This approach offers a high-degree of control and flexibility over the trace output. However, in order to use this approach you should understand not only the significance of each parameter, but also the impact of tracing on Unified Communications Manager server performance. For example, setting trace levels to "Error" has a minimal impact to CPU cycles while leaving the "Detail" level set for long periods of time may impact call processing. For instructions on setting individual trace levels, see the Cisco Unified Serviceability Administration Guide, "Configuring Trace" chapter.

- **Apply predefined trace levels**: This approach allows you to quickly enable and disable tracing for each Unified Communications Manager service based on predefined levels. You can also use these default troubleshooting trace settings in combination with customized settings to temporarily override the your custom settings. For instructions on using the Troubleshooting Trace Settings option in the Cisco Unified Communications Manager Serviceability interface, see the Cisco Unified Serviceability Administration Guide, "Configuring Troubleshooting Trace Setting Configuration" chapter.

Debug Trace Settings for Unified IP IVR System

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

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

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

IVR Flowcharts

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

For calls received during high traffic periods, with more than 20 calls queued up for agents, the flowchart indicates the announcements played to the callers and how the calls are routed. This type of flowchart is useful for troubleshooting problems reported by external users (customers). While Figure 5-2 shows a fairly simple example, where calls stay within a particular site, some contact center applications may overflow calls to other sites. In those cases, the overflow calls may traverse an IP WAN to a secondary site and may be handled by additional devices. In situations like that, you need to also view a network topology diagram for the secondary site to trace the call processing.

Figure 5-2   Interactive Voice Response Flowchart Example
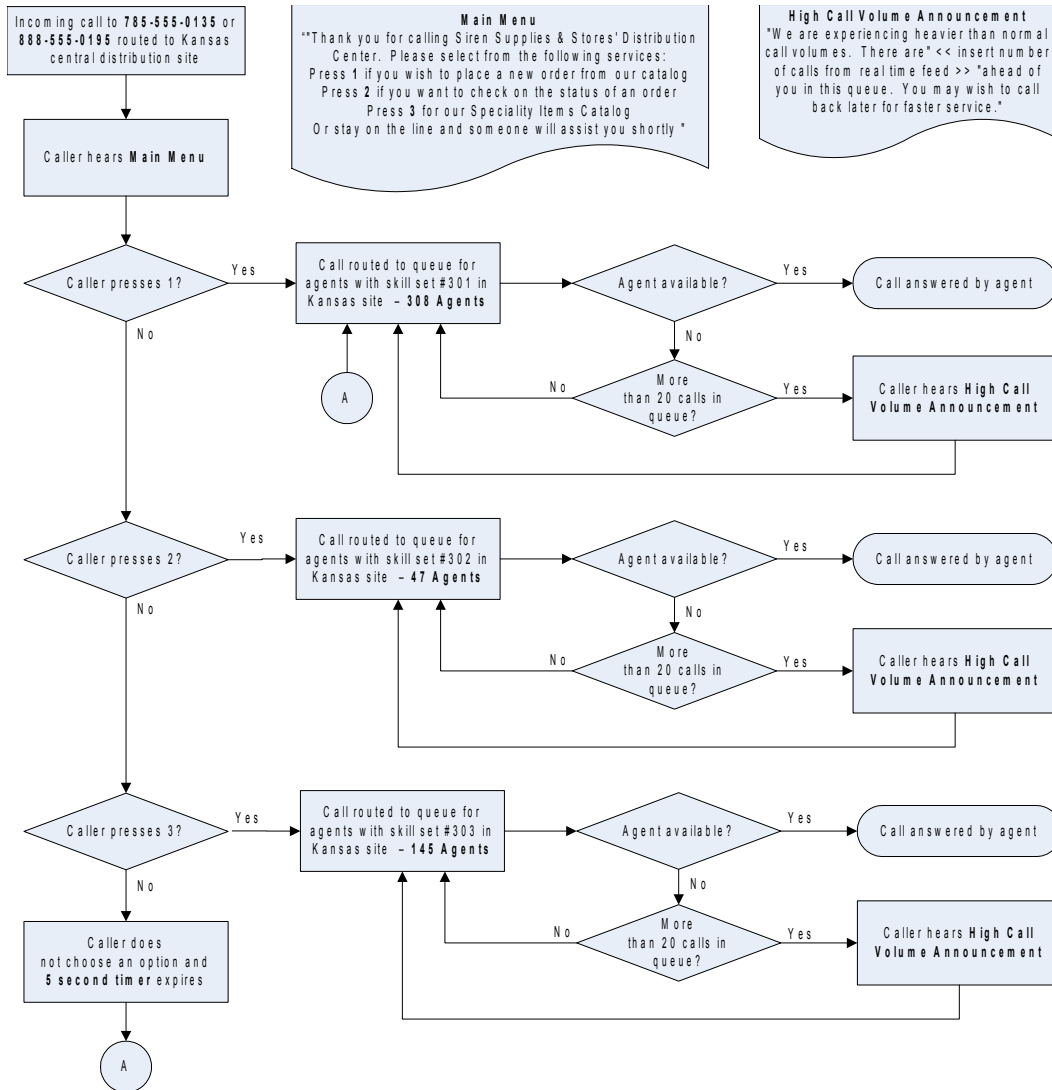
Conduct User Acceptance Test

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

Testing the customer solution involves the following tasks:

- Determine the user acceptance test parameters and deliverables and record these in the user acceptance test plan.

- Conduct a prelaunch test—Using an incremental approach, test the solution against the system design in a low-risk environment with limited users. If the system is stable, the rollout pace is increased until the full implementation is operational.

- The customer signs the Ready-for-Use Acceptance Letter acknowledging that the acceptance test yielded satisfactory results.

Train End Users

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

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

Additional Sites and Services

Steps to Success is a Cisco methodology that outlines the tasks required to complete a successful customer engagement. Registered users can visit the Steps to Success resource site for Cisco Collaboration 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 Services for Unified Communications site.

6

Operate

Introduction to Operating the System

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

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

Before You Begin

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

Output of This Process

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

Major Tasks in This Process

- Managing Your System
- Backing Up and Restoring Components
- Using Network Monitoring Tools
- Operating Contact Center Systems
- Troubleshooting Daily Operations

Managing Your System

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

System Management Tasks

Managing a Cisco Collaboration 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 Collaboration 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 Collaboration system including network devices, phones/clients, software upgrades, voicemail 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 Collaboration system:

- Do It Yourself—In this model, you are responsible for managing the entire Cisco Collaboration system. This approach requires developing business processes; integrating, provisioning and maintaining network management tools; and developing data and voice management skills and knowledge.

- Outtasking Hybrid Model—Using the Cisco Unified Communications Essential Operate Services, Cisco together with its partners allow your organization to communicate more effectively, resulting in improved customer satisfaction, simplified business processes, and increased productivity and profitability.

Backing Up and Restoring Components

This topic provides details on backup and restore for Cisco Collaboration Systems components. First and foremost, the backup of Cisco Collaboration Systems 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 Collaboration Systems application CDs.

- Define incremental and full backup methodologies and schedules, assign an owner for each Collaboration Systems 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 Collaboration Systems components.

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

- Cisco Unified Communications Manager
- Cisco Unified Contact Express
- Cisco Unified Contact Management Enterprise
- Cisco Unified Communication Manager IM and Presence Service

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

Cisco Unified Communications Manager

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

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

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

Cisco Unified Contact Express

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

Cisco Unified Contact Management Enterprise

For Cisco Unified Contact Management Enterprise, the MicroSoft backup strategies for SQL Server are recommended. For more information, see the Disaster Recovery System Administration Guide for Unified Communications Manager.

Cisco Unified Communication Manager IM and Presence Service

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

Using Network Monitoring Tools

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

*   Cisco Prime Collaboration

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

Cisco Prime Collaboration

Cisco Prime Collaboration removes management complexity and provides automated, accelerated provisioning, real-time monitoring, proactive troubleshooting, and long-term trending and analytics in one integrated product. The solution delivers a premier operations experience through an intuitive user interface and optimized operator methodology, including automated workflows that ease implementation and ongoing administration.

Provisioning features include automated processes for Cisco Collaboration Systems and Cisco TelePresence®. An intuitive user interface provides a single view of a subscriber and the subscriber's services, as well as a consolidated view of subscribers across the enterprise. With these capabilities, Cisco Prime Collaboration significantly accelerates site rollouts and dramatically reduces the time required for ongoing changes. In addition, by simplifying moves, adds, and changes, the solution facilitates delegation of these tasks, allowing organizations to optimize IT resources and further reduce total cost of ownership.

Cisco Prime Collaboration provides efficient, integrated service assurance management through a single, consolidated view of the Cisco voice and video collaboration environment. This includes continuous, real-time monitoring and advanced troubleshooting tools for Cisco Collaboration Systems and Cisco TelePresence systems including the underlying transport infrastructures.

For details go to Cisco Prime Collaboration.

Operating Contact Center Systems

Sample call flows were tested and verified for the test bed in the contact center system. For more information see:

http://www.cisco.com/c/en/us/td/docs/voice_ip_comm/uc_system/V10-5-1/Release-Notes/VTGS_BK_SE3ABE6E_00_system-release-notes-for-contact.html#VTGS_TP_F6596057_00

Troubleshooting Daily Operations

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

- Common Problems Reported by Users
- Failover and Recovery Procedures

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

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

Common Problems Reported by Users

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

- One-Way Audio
- Poor Voice Quality

One-Way Audio

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

1. Verify Bidirectional IP Connectivity.
2. Check Cisco IOS Software Gateway Configurations.
3. Check for NAT or Firewall Restrictions.

For additional directions on troubleshooting one-way audio problems, refer to the Troubleshooting One-Way Voice Issues Tech Note 🗎.

Verify Bidirectional IP Connectivity

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

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

- If one of the devices is a Unified IP phone, the DHCP scope has an incorrectly configured default gateway parameter.

- If one of the devices is a Cisco IOS software gateway, the default route is correct. Also, ping the other end from the gateway. If the ping is successful, you know that you have IP connectivity. If the ping is unsuccessful, perform a **traceroute** to determine where the problem lies.

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

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

1. Connect the sniffer to the back of the originating IP phone and make verify that the phone is actually transmitting packets.

2. On the originating phone, verify that the IP address and MAC address information is correct.

3. If the network settings on the originating phone are correct, go to the terminating IP phone to verify that the packets are not arriving.

4. If the voice packets are not arriving at the terminating phone, move the sniffer from network hop to network hop to isolate where the packets are being dropped. A common reason for a problem such as this is a missing or improperly configured IP route.

Check Cisco IOS Software Gateway Configurations

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

1. Check if IP routing is enabled on the gateway that you are using—You do not need to be running a routing protocol such as RIP, EIGRP, or OSPF, but IP routing must not be disabled. Make sure that the **no ip routing** command is not in your configuration. If it is, be sure to eliminate it by configuring the **ip routing** command. You can also issue the **show ip route** command to see if IP routing is enabled. If IP routing is disabled, there are no routes listed in the output, and the list of routing protocols is not present.

2. Determine if the VoIP subsystem is enabled—The VoIP subsystem in Cisco IOS software uses the IP routing code to aid in encapsulating and transmitting the VoIP packets, so the subsystem must be enabled to transmit and receive VoIP packets. It does not need the IP routing code to perform signaling such as H.323 or MGCP, so the signaling still works with IP routing disabled.

3. Check IP address configurations on gateway interfaces—Another common occurrence of one-way audio appears on Cisco IOS software H.323 voice gateways that have more than one data interface, such as a gateway that has both an Ethernet connection to the LAN and a serial connection to the WAN. When an H.323 gateway is configured in Cisco Unified Communications Manager Administration, you configure a specific IP address. Cisco Unified Communications Manager always uses this IP address for all its signaling to the gateway; however, Cisco IOS software voice gateways by default use the IP address of the interface that is closest to the destination. This could be a problem if Unified Communications Manager is connected via one interface and the device to which the RTP audio stream is destined for is connected to a different interface. To force the voice gateway to always use the same IP address, configure the **h323-gateway voip bind srcaddr** *ip-address* command on the interface that you are using for signaling on the Cisco IOS software voice gateway. Make sure this is the same IP address configured in Cisco Unified Communications Manager Administration. Failure to do so could result in one-way audio when the gateway tries to use a different source interface than the one configured in Unified Communications Manager.

4. Configure **voice rtp send-recv** on the gateway—Sometimes you have one-way audio problems only when calling specific numbers, such as 411 or 911 in the North American numbering plan (NANP) or after you transfer a call or put it on hold. If you are having these problems when going through a Cisco IOS software voice gateway, be sure that the **voice rtp send-recv** command is configured on the gateway. Numbers such as 411 and 911 sometimes do not send back answer supervision (that is, an ISDN connect message) when the remote end answers. As a result, the Cisco IOS software voice gateway does not cut through audio in both directions to prevent toll fraud. Configuring the **voice rtp send-recv** command forces the voice gateway to cut through audio in both directions immediately.

5. If you are using a Cisco AS5350 or AS5400 as a gateway, configure the **no voice-fastpath enable** command in global configuration mode—When enabled, this command causes the voice gateway to cache the IP address and UDP port number information for the logical channel opened for a specific call and forwards the packets using the cached information. This helps marginally reduce CPU utilization in high-call-volume scenarios. Because of how Cisco Unified Communications Manager opens and closes logical channels to redirect RTP audio streams, such as in the case of a transfer or music on hold (MOH) server, the Cisco AS5350 and AS5400 cache the IP address information of the old IP address. Therefore, you end up with one-way audio when the call gets redirected to a new IP address because the voice gateway still uses the cached information instead of the newly negotiated information.

Check for NAT or Firewall Restrictions

One common cause of one-way or no-way audio is when Network Address Translation (NAT), Port Address Translation (PAT), or firewalls exist between two terminating devices. 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 terminating devices 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 device is a Cisco IOS software voice gateway, you see an error displayed on the console that looks similar to the following:

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

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

> **test dsprm slot #**

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

Poor Voice Quality

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

A variety of issues can result in poor voice quality:

- Packet Drops
- Queuing Problems

In addition to the information in this section, refer to the Troubleshooting QOS Choppy Voice Issues 📄 document on Cisco.com for additional techniques on resolving voice quality issues.

Packet Drops

IP telephony demands that voice packets reach their destination within a predicable 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 t 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 terminating devices 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 terminating devices, 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 device 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 device 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 terminating devices involved in a call (switches, routers, firewalls, and so on) is a potential source of queuing or buffering delays. The ideal way to troubleshoot a problem in which the symptoms point to delayed or jittered packets is to use a sniffer trace at each network hop to see where the delay or jitter is being introduced.

For more information on jitter, refer to the Understanding Jitter in Packet Voice Networks 🔒 document on Cisco.com.

Failover and Recovery Procedures

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

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

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

The Disaster Recovery System includes the following capabilities:

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

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

For more information on the Cisco Unified Communications Manager Disaster Recovery System, see the Disaster Recovery System Administration Guide for Unified Communications Manager.

Additional Sites and Services

Steps to Success is a Cisco methodology that outlines the tasks required to complete a successful customer engagement. Registered users can visit the Steps to Success resource site for Cisco Collaboration Systems 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 Services for Unified Communications site.

7

Optimize

Optimizing Your System

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

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

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

Input to This Process

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

Output of This Process

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

Major Tasks in This Process

- Performing Your System Upgrade
- Failover and Redundancy

Performing Your System Upgrade

Before You Begin

See Preparing for Your System Installation on the Plan tab to plan your overall strategy.

Upgrade Contact Center Software Components

After you have your upgrade plan and preparations in place, perform your system upgrade by following the guidelines and sequence in Component Installation and Configuration Guides.

- See Collaboration Deployments model chapter in the 10.x SRND

Failover and Redundancy

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

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

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 Services for Unified Communications site.

8

Training Library

Using the Training Library

This tab includes training resources to help you learn more about Cisco Collaboration Systems. 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 partners and resellers.
- Training Available to Cisco Employees contains resources available for internal use only.

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

General Training

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

- The Cisco Learning Network
- Global Learning Locator
- Featured Virtual Events and Webcasts
- Cisco Press self-study resources

Training Available to Partners

Cisco offers a variety of training resources to partners. This topic describes some courses that are specific to Cisco Collaboration Systems Release 10.5(1).

Some Cisco Collaboration Systems training VoDs are available from the Cisco Unified Communications System Release Technical Readiness page. Click the Tools & Training tab on the readiness page for more information on partner training.

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

Note   To access this site you must be registered as an employee of a Cisco Channel Partner company.

- Partner Education Connection

Partner Education Connection Courses

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

Use the following e-learning modules for information on Cisco Collaboration Systems Release 10.5(1):

- QuickStart modules

  These web-based modules prepare partners to sell Cisco Collaboration Systems solutions. This course covers selling strategies, pricing, and customer testimonials.

- Partner Beta Training

  The PEC site typically contains a VoD which provides information on what is new in the latest Cisco Collaboration system.

- Cisco Collaboration Systems Architecture and Design

  These web-based modules address identifying the features of the Cisco Collaboration system and teaching the Cisco methodology for implementing voice over data networks.

Cisco Learning Partner Courses

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

Training Available to Cisco Employees

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

- Partner Education Connection
- Global Learning Partner Locator

8

Resource Library

Using the Resource Library

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

- System Release Documentation
- Solution Reference Network Design
- Tested Deployment and Site Models
- Network Topology Diagrams
- Component Resources
- System Compatibility Tool
- Ordering Guides
- End-of-Sale and End-of-Life Products
- Cisco Unified Workspace Licensing

System Release Documentation

The following system-level documents are produced for Cisco Collaboration Systems releases:

- System Description
- System Release Notes
- System Release Notes
- System Release Summary Matrix
- Documentation Wiki

System Description

This document provides an overview of the Cisco Collaboration Systems Release 10.5(1). It describes the Cisco Collaboration system-level approach, lists key features of the Cisco Collaboration Systems components, and illustrates the Cisco Collaboration Systems deployment models.

- System Description for Cisco Collaboration Systems Release 10.5(1)

System Release Notes

These documents describe the tested functionality, new and changed features, and limitations and restrictions for each of the following Cisco Collaboration Systems Release 10.5(1) solutions:

- Contact Center

    – System Release Notes for Contact Center: Cisco Collaboration Systems Release 10.5(1)

- Collaboration

    – Collaboration System Release Notes for Cisco Collaboration Systems Release 10.5(1)

System Release Summary Matrix

The summary matrix tables identify the software release versions of the system components that are used in each Cisco Collaboration Systems release for Contact Center and Collaboration.

Cisco Collaboration System Release Summary Matrix for Contact Center 10.5(1)

Cisco Collaboration System Release Summary Matrix for Collaboration 10.5(1)

Documentation Wiki

The Cisco documentation wiki (DocWiki) contains information on a number of Cisco product-related topics. Among these is a category for Cisco Collaboration systems, which currently includes topics for:

- Unified Communications System Design: These topics include information and tutorials on design tools such as the Cisco Unified Communications Sizing Tool, which can be used to design and model solutions for existing and prospective customers.

- Unified Communications System Implementation: This topic includes information on configuring system components, and provides detailed configuration examples based on tested deployment models.

- Unified Communications System Operations: This topic includes information on the tasks you need to perform to maintain your system and keep it operating as trouble-free as possible. These tasks are broken down into two areas: one-time and infrequent tasks, and regular and scheduled tasks.

- Unified Communications System Optimization: This topic includes information on the tasks you need to perform to optimize your system and keep it operating as trouble-free as possible.

- Unified Communications System Troubleshooting: This topic includes information that will assist you with isolating and resolving problems you may have with Cisco Collaboration Systems components. This topic offers sections for system troubleshooting methodology and commonly encountered problems.

- Unified Communications Virtualization: This topic includes information on running Cisco Collaboration Systems applications on a virtual machine in a Unified Computing System (UCS) environment.

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

Solution Reference Network Design

The Solution Reference Network Design (SRND) user guides provide considerations and guidelines for deploying components of the Cisco Collaboration Systems solution. SRND resources are available at http://www.cisco.com/go/srnd.

Tested Deployment and Site Models

Cisco Collaboration Systems Release 10.5(1) testing is designed to test the hardware and software components that work together in a multisite distributed deployment. For these tests, several site models are created. Each site model is designed to test a specific set of features and interactions. For information about the components, configurations, and environment tested, see Table 8-1.

Table 8-1   *Tested Deployment and Site Models*

Deployment Model	Description
Single-site model	This model is designed for autonomous offices in which most, or all, employees are IPC users. This model can support a maximum 30,000 users.
Multisite centralized call processing model	This model is designed for distributed operations with a large central office or headquarters site, with multiple remote or branch sites. This model can support a maximum of 30,000 phones distributed among a maximum of 1000 sites. Based on the bandwidth available, each site can support any number of users and a maximum of 30,000 phones.
Multisite distributed call processing model	This model is designed for organizations with large user populations or large numbers of geographically distributed sites with a need for more than a single call processing entity. This model is suited for deployments that require multiple Cisco Unified Communications Manager clusters or Cisco Unified Communications Manager Express platforms. Each call processing entity in this model is configured as a single-site model or multisite centralized call processing model, and each has a common dial plan and feature set. The multisite distributed call processing model supports up to 30,000 SCCP or SIP IP phones or video devices per cluster.
Clustering over IP WAN call processing model	This model is designed for organizations with large user populations across multiple sites that are connected by an IP WAN with the QoS features enabled. This model supports the local failover deployment model and the remote failover deployment model.

Network Topology Diagrams

- Network Topology Diagrams for Contact Center
- Network Topology Diagrams for Collaboration

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

Network Topology Diagrams for Contact Center

Table 8-2   Network Topology Diagrams for Contact Center

Description	Filename
Zip file includes logical and physical drawings in Test Bed as listed below.	CC__CSR1051__UCCE_Topology.zip (right-click to download zip) 4 MB **Note** If you click the link rather than right-click, the zip file may open in the secondary window but also replace the contents of this window. Use the Back button to return to this window.
Unified CCE components in Test Bed1	CC_CSR1051_UCCE_Topology.vsd
Zip file includes logical and physical drawings in Test Bed as listed below.	CC_CSR1051__UCCX_Topology.zip (right-click to download zip) 3 MB **Note** If you click the link rather than right-click, the zip file may open in the secondary window but also replace the contents of this window. Use the Back button to return to this window.
Unified CCX components in Test Bed2	CC_CSR1051_UCCX_Topology.vsd

Network Topology Diagrams for Collaboration

Table 8-3   Network Topology Diagrams for Collaboration

Description	Filename
Zip file includes the site model topology drawings listed below.	COL_CSR1051_Topology.zip (9) MB **Note** If you click the link rather than right-click, the zip file may open in the secondary window but also replace the contents of this window. Use the Back button to return to this window.
Collaboration Site in Test Bed	COL_CSR1051_Topology.vsd

Component Resources

For Cisco Collaboration Systems Release 10.5(1), there are two types of resources that provide descriptive information on each component in the solution:

- Component Resources Documentation

- Configuration Command Files

Component Resources Documentation

Depending on your Cisco Collaboration Systems solution type, choose one of the following sets of component resources documentation:

- Component Resources Documentation for Contact Center
- Component Resources Documentation for Collaboration

Component Resources Documentation for Contact Center

For links to the main page for documentation on Cisco Collaboration Systems Contact Center components, go to Product documentation.

For documentation on specific tasks, see Component Installation and Configuration Guides on the Implement tab. For documentation on all other Cisco products, go to System Release Notes for Contact Center: Cisco Collaboration Systems Release 10.5(1).

Component Resources Documentation for Collaboration

For links to the main page for documentation on Cisco Collaboration Systems components, go to Product documentation.

For documentation on specific tasks, see Component Installation and Configuration on the Implement tab. For documentation on all other Cisco products, go to Collaboration System Release Notes for Cisco Collaboration Systems Release 10.5(1).

Configuration Command Files

To understand how various components were configured during Cisco Collaboration systems testing, review the contents of the ZIP archives described in one of the following sections:

- Configuration Command Files for Contact Center
- Configuration Command Files for Collaboration Systems

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

Configuration Command Files for Contact Center

Table 8-4 describes the contents of three ZIP files that you can download. Each ZIP file contains text files that contain the output from issuing a **show running-config** IOS command on various infrastructure components in the contact center test beds.

Table 8-4   *Configuration Command Files for Contact Center*

Description	Filename
Test Bed Local & Remote Agent Call Flows: **Cisco Unified Customer Voice Portal (CVP) Post-Routed Call Flow Components**	CC_CSR1051_UCCE_Configs.zip (right-click to download zip) includes the files below. **Note** If you click the link rather than right-click, the zip file may open in the secondary window but also replace the contents of this window. Use your Back button to return to this window.
Test Bed 2 Local & Remote Agent Call Flows: **Cisco Unified Contact Center Express (Unified CCX) Call Flow Components.**	CC_CSR1051_UCCX_Configs.zip (right-click to download zip) includes the files below. **Note** If you click the link rather than right-click, the zip file may open in the secondary window but also replace the contents of this window. Use your Back button to return to this window.

Configuration Command Files for Collaboration Systems

Table 8-5 describes the contents of a ZIP file with sample IP telephony configurations that you can download. Each ZIP file contains text files that contain the output from issuing a **show running-config** IOS command on various components in the IP telephony tested deployments.

Table 8-5   *Configuration Command Files for Collaboration*

Description	Filename
Zip file includes Cisco device configurations listed below: **Note** Some parameters, such as passwords, have been removed from the configuration files for security reasons.	COL_CSR1051_Configs.zip (right-click to download zip) includes the files below. **Note** If you click the link rather than right-click, the zip file may open in the secondary window but also replace the contents of this window. Use your Back button to return to this window.
London/Heathrow (LHR) Cisco Unified Survivable Remote Site Telephony (Unified SRST) SIP	lhr-srst-sip-01-confg.txt
Seattle (SEA) Unified SRST SIP	sea-srst-sip-01-confg.txt
San Francisco (SFO) Cisco Unified Border Element (CUBE) Cisco Aggregation Services Router (Cisco ASR)	sfo-cube-asr-01-confg.txt
PWashington DC (WDC) MGCP	wdc-pstn-mgcp-01-confg.txt

System Compatibility Tool

The Cisco Collaboration Systems Compatibility Tool provides tables that identify the compatible software release versions for each product element in each release.

Ordering Guides

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

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

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

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

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

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

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

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

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

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

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

Cisco Unified Workspace Licensing

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

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

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History

This technical information site and related documentation for Cisco Collaboration Systems for Contact Center Release 10.5(1) are updated periodically. This history highlights major content and navigational changes in the technical information site for each release.

Release 10.5(1)

Revision Date	Comments
May 2014	Initial release containing the following new and updated content: • New information for Test Bed 1 (Unified CCE (4000Agents-6000 calls) includes operating conditions, deployment model and deployment options. • New information for Test Bed 2 (Unified CCX) includes operating conditions, deployment model and deployment options. • New Network Topology Diagrams show the arrangement of the tested equipment. • New Configuration Command Files provide examples of how the tested equipment was configured. See System Release Notes for Contact Center: Cisco Collaboration Systems Release 10.5(1) for a list of the new products introduced in this release.

Release 10.0(1)

Revision Date	Comments
December 2013	Initial release containing the following new and updated content: • New information for Test Bed (Cisco Unified Customer Voice Portal (CVP) Post-Routed Call Flow Components) includes operating conditions, deployment model, deployment options, and equipment tables. • New Network Topology Diagrams show the arrangement of the tested equipment. • New Configuration Command Files provide examples of how the tested equipment was configured. See System Release Notes for Contact Center: Cisco Collaboration Systems Release 10.0(1) for a list of the new products introduced in this release.

Release 9.0(1)

Revision Date	Comments
August 2012	Initial release containing the following new and updated content: • New information for Test Bed (Cisco Unified Customer Voice Portal (CVP) Post-Routed Call Flow Components) includes operating conditions, deployment model, deployment options, and equipment tables. • New Network Topology Diagrams show the arrangement of the tested equipment. • New Configuration Command Files provide examples of how the tested equipment was configured. See System Release Notes for Contact Center: Cisco Unified Communications System, Release 9.0(1) for a list of the new products introduced in this release.

Release 8.6(1)

Revision Date	Comments
June 2011	Initial release containing the following new and updated content: • New information for Test Bed 3 (Unified CVP Post-Routed) includes operating conditions, deployment model, deployment options, and equipment tables. • New Network Topology Diagrams show the arrangement of the tested equipment. • New Configuration Command Files provide examples of how the tested equipment was configured. See System Release Notes for Contact Center: Cisco Unified Communications System, Release 8.6(1) for a list of the new products introduced in this release.

Release 8.5(1)

Revision Date	Comments
December 2010	Initial release containing the following new and updated content: • New Network Topology Diagrams show the arrangement of the tested equipment. • New Configuration Command Files provide examples of how the tested equipment was configured. See System Release Notes for Contact Center: Cisco Unified Communications System, Release 8.5(1) for a list of the new products introduced in this release.

Release 8.0(2)

Revision Date	Comments
June 2010	Update to include products that were not available at Release 8.0(2) FCS and to provide System Test Results that describe the system-level testing performed.
April 2010	Initial release containing the following new and updated content: • New Network Topology Diagrams show the arrangement of the tested equipment. • New Configuration Command Files provide examples of how the tested equipment was configured. See System Release Notes for Contact Center: Cisco Unified Communications System, Release 8.0(2) for a list of the new products introduced in this release.

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