CHAPTER 1

Introduction

Last revised on: August 5, 2008

The Cisco Unified Communications System delivers fully integrated communications by enabling data, voice, and video to be transmitted over a single network infrastructure using standards-based Internet Protocol (IP). Leveraging the framework provided by Cisco IP hardware and software products, the Cisco Unified Communications System delivers unparalleled performance and capabilities to address current and emerging communications needs in the enterprise environment. The Cisco Unified Communications family of products is designed to optimize feature functionality, reduce configuration and maintenance requirements, and provide interoperability with a wide variety of other applications. The Cisco Unified Communications System provides this capability while maintaining a high level of availability, quality of service (QoS), and security for your network.

The Cisco Unified Communications System incorporates and integrates the following major communications technologies:

- IP telephony

  IP telephony refers to technology that transmits voice communications over a network using IP standards. Cisco Unified Communications includes a wide array of hardware and software products such as call processing agents, IP phones (both wired and wireless), voice messaging systems, video devices, and many special applications.

- Customer contact center

  Cisco Unified Contact Center products are a combination of strategy and architecture that promote efficient and effective customer communications across a globally capable network by enabling organizations to draw from a broader range of resources to service customers. They include access to a large pool of agents and multiple channels of communication as well as customer self-help tools.

- Video telephony

  The Cisco Unified Video Advantage products enable real-time video communications and collaboration using the same IP network and call processing agent as Cisco Unified Communications. With Cisco Unified Video Advantage, making a video call is as easy as dialing a phone number.

- Rich-media conferencing

  Cisco Conference Connection, Cisco Unified MeetingPlace and MeetingPlace Express enhance the virtual meeting environment with a integrated set of IP-based tools for voice, video, and web conferencing.

- Mobility

  Cisco wireless and mobility solutions enable users to increase productivity and responsiveness by enabling access to network resources and applications securely, regardless of location or client device.

- TelePresence

  Cisco TelePresence delivers real-time, face-to-face interactions between people and places in their work and personal lives using advanced visual, audio, and collaboration technologies. These technologies transmit life-size, high-definition images and spatial discrete audio that make users feel like they are in the same room even when they are half a world away.

- Third-party applications

  Cisco works with leading-edge companies to provide the broadest selection of innovative third-party IP communications applications and products focused on critical business needs such messaging, customer care, and workforce optimization.

The remainder of this document focuses on system design considerations for the following components of the Cisco Unified Communications System:

- Cisco Unified Communications Manager (Unified CM), formerly Cisco Unified CallManager
- Cisco Unified Communications Manager Business Edition (Unified CMBE)
- Cisco Unified MeetingPlace and MeetingPlace Express
- Cisco Unity and Unity Express
- Cisco Unified Video Advantage
- Cisco Unified Communications endpoints
- Cisco Unified Presence
- Cisco Unified Communications applications

For information about other aspects of the Cisco Unified Communications System, such as Cisco Unified Contact Center, refer to the documentation available at the following locations:

http://www.cisco.com/go/ucsrnd

http://www.cisco.com/go/unified-techinfo

You can also find additional documentation for the Cisco Unified Communications family of products at the following location:

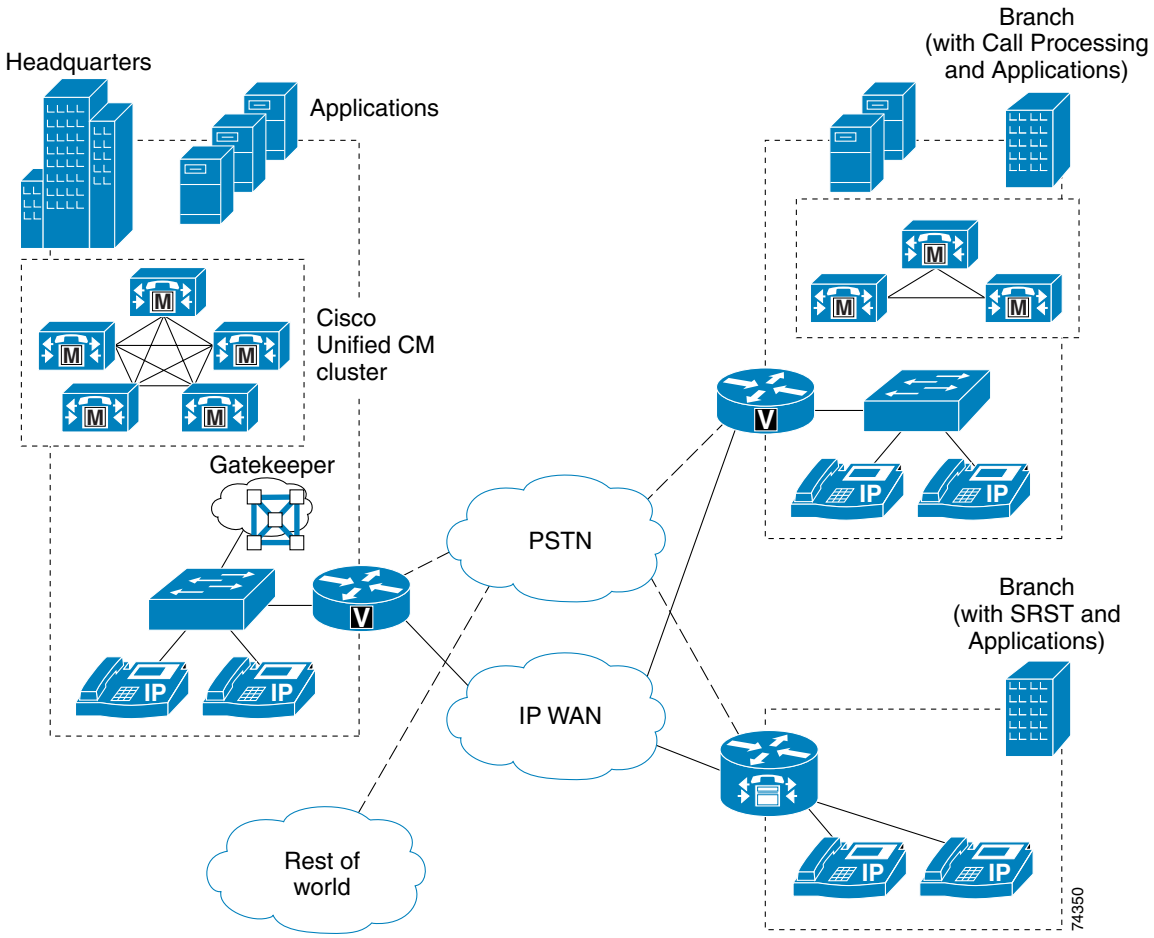
http://www.cisco.com

Overview of Cisco Unified Communications

The Cisco Unified Communications System is the leading converged network unified communications solution for organizations that want to increase productivity and reduce the costs associated with managing and maintaining separate voice and data networks. The flexibility and sophisticated functionality of the Cisco IP network infrastructure provides the framework that permits rapid deployment of emerging applications such as desktop IP telephony, unified messaging, telepresence, mobility, desktop collaboration, enterprise application integration with IP phone displays, and collaborative IP contact centers. These applications enhance productivity and increase enterprise revenues.

Figure 1-1 illustrates a typical Cisco Unified Communications deployment employing the Cisco IP network infrastructure, with Cisco Unified Communications Manager (Unified CM) as the call processing agent.

Figure 1-1 Typical Unified Communications Deployment



The foundation architecture for Cisco Unified Communications includes of the following major components (see Figure 1-1):

- Cisco IP Network Infrastructure, page 1-4
- Quality of Service, page 1-4
- Call Processing Agent, page 1-4
- Communication Endpoints, page 1-5
- Presence, page 1-6
- Conferencing, Messaging, and Collaboration Capabilities, page 1-7
- Applications, page 1-8
- Security, page 1-10
- Network Management, page 1-10

Cisco IP Network Infrastructure

The network infrastructure includes public switched telephone network (PSTN) gateways, analog phone support, and digital signal processor (DSP) farms. The infrastructure can support multiple client types such as hardware phones, software phones, and video devices. The infrastructure also includes the interfaces and features necessary to integrate legacy PBX, voicemail, and directory systems. Typical products used to build the infrastructure include Cisco voice gateways (non-routing, routing, and integrated), Cisco IOS and Catalyst switches, and Cisco routers.

For more information about the IP network infrastructure, see the chapter on Network Infrastructure, page 3-1.

Quality of Service

Voice, as a class of IP network traffic, has strict requirements concerning packet loss, delay, and delay variation (also known as jitter). To meet these requirements for voice traffic, Cisco Unified Communications includes Quality of Service (QoS) features such as traffic classification, queuing, traffic shaping, compressed Real-Time Transport Protocol (cRTP), and Transmission Control Protocol (TCP) header compression.

The QoS components for Cisco Unified Communications are provided through the rich IP traffic management, queueing, and shaping capabilities of the Cisco IP network infrastructure. Key elements of this infrastructure that enable QoS for Cisco Unified Communications include:

- Traffic marking
- Enhanced queuing services
- Link fragmentation and interleaving (LFI)
- Compressed RTP (cRTP)
- Low-latency queuing (LLQ)
- Link efficiency
- Traffic shaping
- Call admission control (bandwidth allocation)

For more information about QoS, see the various sections on QoS in the chapter on Network Infrastructure, page 3-1.

Call Processing Agent

Cisco Unified Communications Manager (Unified CM) is the core call processing software for the Cisco Unified Communications System. It builds call processing capabilities on top of the Cisco IP network infrastructure. Unified CM software extends enterprise telephony features and capabilities to packet telephony network devices such as IP phones, media processing devices, voice gateways, and multimedia applications.

You can deploy the call processing capabilities of Unified CM according to one of the following models, depending on the size, geographical distribution, and functional requirements of your enterprise:

- Single-site call processing model

  In the single-site model, each site or campus has its own Unified CM or cluster of Unified CMs to perform call processing functions. No voice traffic travels over the IP WAN; instead, external calls or calls to remote sites use the public switched telephone network (PSTN).

- Multisite WAN model with centralized call processing

  In the multisite WAN model with centralized call processing, the Unified CM cluster resides at the main (or central) campus, and communication with remote branch offices normally takes place over the IP WAN. If either the central site or the IP WAN is down, the remote sites can continue to have service through a feature called Survivable Remote Site Telephony (SRST). The remote sites can also place calls over the PSTN if the IP WAN is temporarily oversubscribed, and you can interconnect a number of central sites through intercluster trunks.

- Multisite WAN model with distributed call processing

  In the multisite WAN model with distributed call processing, each site has its own Unified CM cluster for call processing. Communication between sites normally takes place over the IP WAN, with the PSTN serving as a backup voice path. With this model, you can interconnect any number of sites across the IP WAN.

- Clustering over the IP WAN

  You may deploy a single Unified CM cluster across multiple sites that are connected by an IP WAN with QoS features enabled. To provide call processing redundancy, you can deploy backup servers either locally at each site or at a remote site across the WAN. Clustering over the WAN is well suited as a disaster recovery plan for business continuance sites or as a single solution for small or medium sites.

For information on how to apply these deployment models in designing your Cisco Unified Communications network, see Unified Communications Deployment Models, page 2-1.

Communication Endpoints

A communication endpoint is a user instrument such as a desk phone or even a software phone application that runs on a PC. In the IP environment, each phone has an Ethernet connection. IP phones have all the functions you expect from a telephone, as well as more advanced features such as the ability to access World Wide Web sites.

In addition to various models of desktop Cisco Unified IP Phones, Unified Communications endpoints include the following devices:

- Software-based endpoints

  Cisco IP Communicator and Cisco Unified Personal Communicator are desktop applications that turn your computer into a full-featured IP phone with the added advantages of call tracking, desktop collaboration, and one-click dialing from online directories. Cisco IP Communicator is a software-based application that delivers enhanced telephony support through the PC. It is designed to meet diverse customer needs by serving as a supplemental telephone when traveling, as a telecommuting device, or as a primary desktop telephone. Cisco Unified Personal Communicator integrates a wide variety of communications applications and services into a single desktop computer application to provide quick and easy access to powerful communications tools for voice, video, web conferencing, call management, directories, and presence information.

- Video telephony endpoints

  Video telephony capability is fully integrated with Cisco Unified CM. In addition, Cisco Unified Video Advantage brings video telephony functionality to Cisco Unified IP Phones and the Cisco IP Communicator softphone application. The video telephony solution consists of a Windows-based application and USB camera. Users make calls from their Cisco Unified IP Phones using the familiar phone interface, and calls are displayed with video on their PCs without requiring any extra button pushes or mouse clicks.

- Wireless (mobility) endpoints

  The Cisco Wireless IP Phones 7920 and 7921G extend the Cisco family of IP phones from 10/100 Ethernet to the wireless LAN (WLAN). Both are hardware-based phones with built-in radio antenna. The Cisco Unified Wireless IP Phone 7920 enables 802.11b wireless LAN connectivity to the network, while the Cisco Unified Wireless IP Phone 7921G enables 802.11b, 802.11g, or 802.11a connectivity to the network. These phones provide features and functionality similar to other Cisco Unified IP Phones.

For more information about the various types of endpoints, see Unified Communications Endpoints, page 20-1.

Presence

Presence refers to the ability and willingness of a user to communicate across a set of devices. Cisco Unified Presence consists of many components that enhance the value of a Cisco Unified Communications system by providing information regarding a user's availability status and communications capabilities. The user's availability status indicates whether or not the user is actively using a particular communications device such as a phone. The user's communications capabilities indicate the types of communications that user is capable of using, such as video conferencing, web collaboration, instant messaging, or basic audio.

User status changes can be determined automatically by recognizing user keyboard activity, phone use, or device connectivity to the network. This status information is gathered from all the available sources, privacy policies are applied, and the current status is aggregated, synchronized, and stored on a server. Desktop applications, calendar applications, and devices can then access the user status information to provide real-time updates for the end users to make better communication decisions.

Status combines the capabilities of what the device or user can do (voice, video, web collaboration, and so forth) and the attributes showing the state of the device or user (available, busy, on a call, and so forth). Presence status can be derived from automatic events such as computer login and telephone off-hook, or it can be derived from explicit notification events for changing status such as the user selecting Do Not Disturb from a change-status pick list.

For more information about presence functionality in a Cisco Unified Communications system, see Cisco Unified Presence, page 22-1.

Conferencing, Messaging, and Collaboration Capabilities

Cisco Unified Communications supports the following additional features and applications to provide conferencing, voice messaging, and multi-media collaboration functionality:

- Conferencing

  Cisco Unified CM can interface with a number of other Cisco software and hardware devices to provide complete conferencing capability, including annunciator functions and music on hold. For more information about designing and provisioning conference capabilities in Unified CM, see Media Resources, page 6-1.

- Unified Messaging

  Unlike proprietary messaging solutions based on time division multiplexing (TDM), the Cisco Unified Communications platform is built on a Cisco standards-based, open-protocol architecture for voice and data. The standards-based services platform combines synchronous and asynchronous message types, including Voice over IP (VoIP), Internet fax, store-and-forward voicemail, and email under a common message store and directory. This arrangement eliminates the need to synchronize disparate message stores and directories, such as different voicemail and email systems, and dramatically reduces operational and maintenance costs. For more information about integrating third-party voicemail systems with Unified CM, see Third-Party Voicemail Design, page 12-1. For more information about integrating Cisco Unity, Unity Express, and Unity Connection with Unified CM, see Cisco Voice Messaging, page 13-1.

- Video Telephony

  Video telephony capability is fully integrated into Cisco Unified CM, and there are also video endpoints available from Cisco and its strategic partners. Video calls and conferences are now just as easy to make as a voice call on an IP phone. For more information about video capability with Unified CM, see IP Video Telephony, page 16-1.

- Multi-Media Collaboration

  Cisco Unified MeetingPlace and Cisco Unified MeetingPlace Express are complete rich-media conferencing applications that integrate voice, video, and web conferencing capabilities to make remote meetings as natural and effective as face-to-face meetings. For more information about integrating MeetingPlace with Unified CM, see Cisco Unified MeetingPlace, page 14-1, and Cisco Unified MeetingPlace Express, page 15-1.

- TelePresence

  Cisco TelePresence is an innovative solution that uses advanced visual, audio, and collaboration technologies to create an "in-person" meeting experience over the converged network. Cisco TelePresence uses the standard IP technology deployed in corporations today and runs on an integrated voice, video, and data network. The system supports high-quality, real-time voice and video communications with branch offices using broadband connections. It offers capabilities for ensuring quality of service (QoS), security, reliability, and high availability for high-bandwidth applications such as high-definition video. Cisco TelePresence is not covered in this document, but more information is available at:

  http://www.cisco.com/en/US/products/ps7060/index.html

Applications

Applications build upon the call processing infrastructure to enhance the end-to-end capabilities of Cisco Unified Communications by adding sophisticated telephony and converged network features such as the following:

- IP Phone Services

  Cisco Unified IP Phone Services are applications that utilize the web client and/or server and XML capabilities of the Cisco Unified IP Phone. The Cisco Unified IP Phone firmware contains a micro-browser that enables limited web browsing capability. These phone service applications provide the potential for value-added services and productivity enhancement by running directly on the user's desktop phone.

- Extension Mobility

  The Cisco Extension Mobility (EM) feature enables users to configure a Cisco Unified IP Phone as their own, on a temporary basis, by logging in to that phone. After a user logs in, the phone adopts the user's individual device profile information, including line numbers, speed dials, services links, and other user-specific properties of a phone. The EM feature dynamically configures a phone according to the authenticated user's device profile. The benefit of this application is that it allows users to be reached at their own extension from any phone within the Cisco Unified CM cluster, regardless of physical location, provided the phone supports EM.

- Cisco Unified Communications Manager Assistant

  Cisco Unified CM Assistant is a Unified CM integrated application that enables assistants to handle incoming calls on behalf of one or more managers. With the use of the Unified CM Assistant Console desktop application, assistants can quickly determine a manager's status and decide what to do with a call. Assistants can manipulate calls using their phone's softkeys or via the PC interface with either keyboard shortcuts, drop-down menus, or by dragging and dropping calls to the managers' proxy lines.

- Attendant Console

  The Cisco Unified Communications Manager Attendant Console (AC) application enables a receptionist to answer and transfer or dispatch calls within an organization. The attendant can install the attendant console, a client/server Java application, on a PC that runs Windows 2000 or Windows XP. The attendant console connects to the Cisco Unified CM Attendant Console Server for login services, line state, and directory services. Multiple attendant consoles can connect to a single AC server.

- WebDialer

  Cisco WebDialer is a click-to-dial application for Cisco Unified CM that enables users to place calls easily from their PCs using any supported phone device. There is no requirement for administrators to manage CTI links or build JTAPI or TAPI applications because Cisco WebDialer provides a simplified web application and HTTP or Simple Objects Access Protocol (SOAP) interface for those who want to provide their own user interface and authentication mechanisms. Either way, the solution scales to support the entire Unified CM cluster with full redundancy.

For more information about these applications, see Cisco Unified CM Applications, page 24-1.

In addition to the preceding applications for enterprise telephony users, Cisco mobility applications provide the ability to deliver features and functionality of the Cisco Unified Communications environment to mobile workers wherever they might be. Mobility functionality delivered within the Cisco Unified Communications solution is provided via the Cisco Unified Mobility application server.

The Unified Mobility server communicates with Cisco Unified CM via the Java Telephony Application Programming Interface (JTAPI) and AVVID XML Layer (AXL), and it provides the following mobility application functionality:

- Mobile Connect

  Mobile Connect or Single Number Reach provides Cisco Unified Communications users with the ability to be reached via a single enterprise phone number that will ring on both their IP desk phone and their cellular phone simultaneously. Mobile Connect users can pick up an incoming call on either their desk or cellular phones and at any point can move the in-progress call from one of these phones to the other without interruption.

- Mid-Call Features

  Mid-call features allow a user to invoke hold, resume, transfer, conferencing, and directed call park features from their mobile phone during in-progress mobility calls. These features are invoked via the mobile phone keypad and take advantage of enterprise media resources such as music on hold and conference bridges.

- Single Enterprise Voicemail Box

  Single Enterprise Voicemail box ensures that any unanswered calls made to the user's enterprise number and extended to the user's mobile phone will end up in the enterprise voicemail system rather than in a mobile voicemail system. This provides a single consolidated voicemail box for all business calls and eliminates the need for users to check multiple voicemail systems for messages.

- Mobile Voice Access and Enterprise Feature Access with two-stage dialing

  Mobile Voice Access and Enterprise Feature Access with two-stage dialing provide mobile users with the ability to make calls from their mobile phone as if they were calling from their enterprise IP desk phone. These features provide a cost savings in terms of toll charges for long distance or international calls, and they provide the enterprise with an easy way to track phone calls made by users via a uniform and centrally located set of call detail records. Furthermore, these features provide the ability to mask a user's mobile phone number when sending outbound caller ID. Instead, the user's enterprise number is sent as caller ID. This ensures that returned calls to the user are made to the enterprise number, thus resulting in enterprise call anchoring.

Cisco Unified Mobile Communicator provides a graphical client that works in conjunction with a server running the Cisco Unified Mobility Advantage software to provide a rich user interface for accessing and controlling mobile phone features and functionality. The system integrates into existing corporate LDAP directories, allowing users to use a single set of credentials across all devices. Further, all traffic between Cisco Unified Mobile Communicator and Unified Mobility Advantage is protected by the Secure Socket Layer (SSL) protocol. Cisco Unified Mobile Communicator provides the following functionality for mobile phone users:

- Access to corporate and personal directories
- Presence and buddy synchronization with the enterprise
- Visual access to corporate voicemail
- Visibility into desk phone history of missed, placed, and received calls
- Secure store-and-forward text messaging
- Reception of conference notifications
- Dial-via-office using Cisco Unified CM

For more information on Cisco Unified Mobility and related applications, see Cisco Mobility Applications, page 25-1.

Security

Security for a Cisco Unified Communications deployment involves the following main considerations, among others:

- Physical security for restricting physical access to important application servers and network components
- Network access security to prevent hostile logins or attacks
- Security measures for Cisco Unified CM, endpoint devices, and various directories and databases
- Mechanisms for defining calling privileges for various classes of users
- Careful network design and management to enhance security

For more information about security for Cisco Unified Communications networks, see Voice Security, page 19-1.

Network Management

Network management is a service consisting of a wide variety of tools, applications, and products to assist network system administrators in provisioning, operating, monitoring and maintaining new and existing network deployments. Network management helps system administrators monitor each network device and network activity so that they can isolate and investigate problems in a timely manner for better performance and productivity. The network management phases typically include: planning, design, implementation, and operation (PDIO). A network manager implements the various management phases to strategically manage the performance and availability of Cisco Unified Communications applications such as voice, video, contact center, and rich media applications.

The Cisco Unified Communications Management Suite offers the following set of integrated tools that help to test, deploy, and monitor the Cisco Unified Communications System:

- Cisco Unified Provisioning Manager (Unified PM) — Manages provisioning of initial deployments and ongoing operational activation for IP communications services.
- Cisco Unified Operations Manager (Unified OM) — Provides comprehensive monitoring with proactive and reactive diagnostics for the entire Cisco Unified Communications System.
- Cisco Unified Service Monitor (Unified SM) — Provides a reliable method of monitoring and evaluating voice quality in Cisco Unified Communications systems.
- Cisco Unified Service Statistics Manager (Unified SSM) — Provides advanced statistics analysis and reporting capabilities for Cisco Unified Communications deployments.
- Cisco Monitor Manager (MM) — Can be deployed in small or medium business (SMB) locations with 5 to 250 users to actively monitor key device parameters in Cisco Unified Communications systems.
- Cisco Monitor Director (MD) — Works in conjunction with Cisco Monitor Manager (MM) for support of active voice and data network management in SMB sites at managed service-provider locations.
- Cisco netManager — Provides managing, monitoring, and diagnostic functionality for Cisco Unified Communication systems in the SMB environment.

For more information on the Cisco Unified Communications Management Suite, see Network Management, page 26-1.