



CHAPTER 1

Introduction

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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 Unified MeetingPlace, Cisco Unified Videoconferencing, and Cisco WebEx Software as a Service 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.
- **Applications**
Cisco provides numerous embedded applications and also works with leading-edge companies to provide the broadest selection of innovative third-party unified 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 deploying these technologies and applications in the Cisco Unified Communications System.

For information about other aspects of the Cisco Unified Communications System, 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>

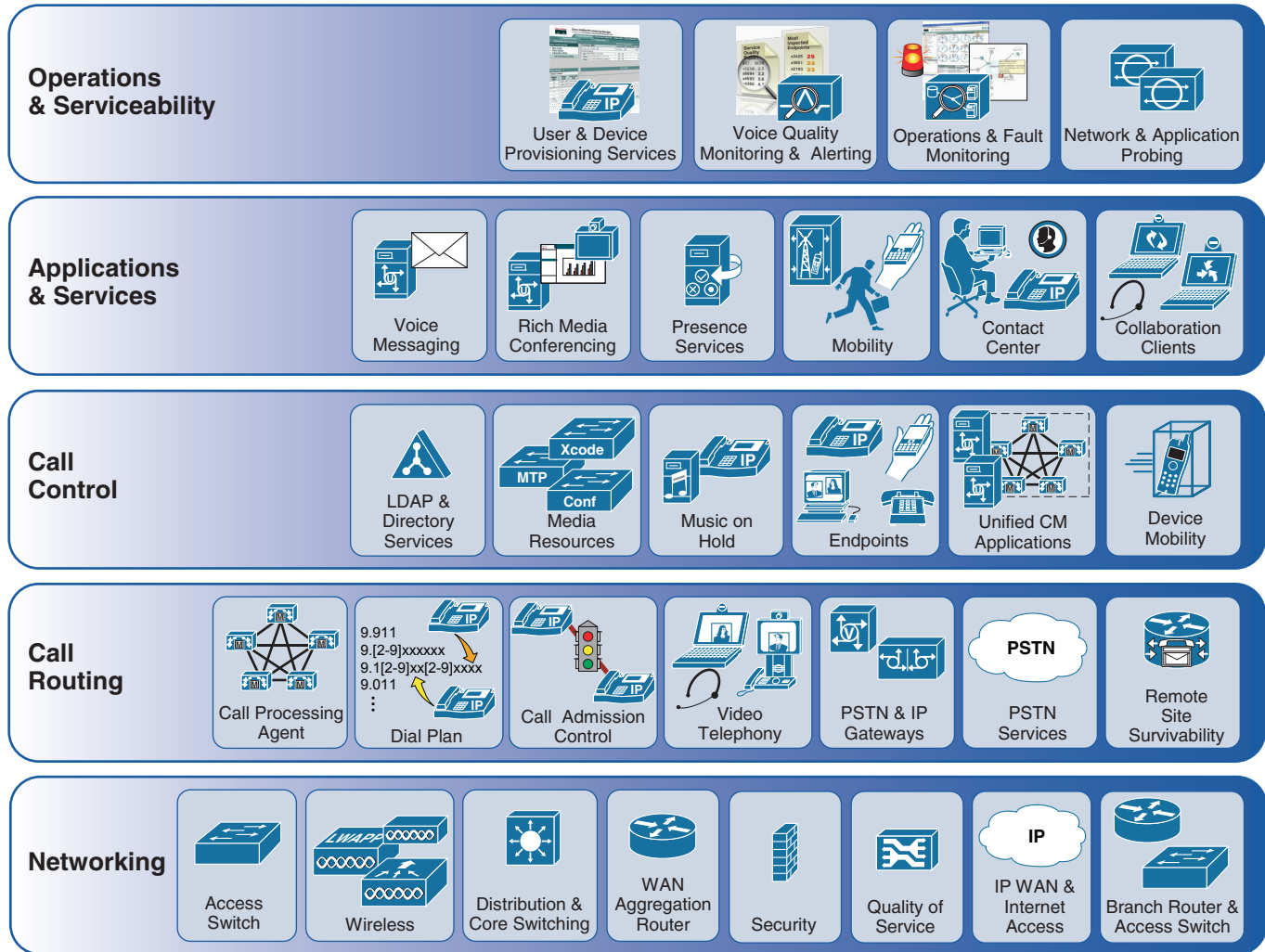
**Note**

The design guidance in this document applies to Cisco customers and partners who want to deploy an Enterprise Unified Communications solution. For those interested in hosted or managed Unified Communication solutions, please refer to <http://www.cisco.com/go/hostedcollab> for more information.

Cisco Unified Communications System Architecture

Figure 1-1 illustrates the layered architecture of the Cisco Unified Communications System.

Figure 1-1 Architecture of the Cisco Unified Communications System



The various layers of the Cisco Unified Communications System perform the following major tasks and roles:

- Networking

This layer forms the foundation for the Unified Communications network. It includes components that provide the following functions and capabilities:

- Network infrastructure ensures a redundant and resilient network foundation with Quality of Service (QoS) enabled for Unified Communications applications.
- Voice security ensures a general security policy and a hardened and secure networking foundation for Unified Communications applications.

- Unified Communications deployment models provide tested models as well as best practices and design guidelines for deploying a Unified Communications System.
- IP telephony migration options provide guidelines on how to plan and approach a migration from standalone voice, video, and collaboration systems to an integrated Cisco Unified Communications System.

For more information on the Networking layer, see the [Overview of Cisco Unified Communications Networking, page 2-1](#).

- Call Routing

This layer handles the processing and routing of calls throughout the system. It includes components that provide the following functions and capabilities:

- Call processing agents provides telephony services and call routing capabilities.
- The dial plan provides endpoint numbering, dialed digits analysis, and classes of restriction to limit types of calls that a user can make.
- Call admission control provides mechanisms for preventing oversubscription of network bandwidth by limiting the number of calls that are allowed on the network at a given time, based on overall call capacity of the call processing components and network bandwidth.
- Video telephony services provide the ability to provision and register video endpoints as well as to set up, route, and maintain video calls on the network.
- PSTN gateways and provider voice and data services provide access to voice and data networks outside the enterprise, including the PSTN, Internet, and service provider IP-based trunks.
- Remote site survivability provides continuation of basic telephony services at remote sites when the central-site telephony services are unavailable due to failed or flapping network connectivity.

For more information on the Call Routing layer, see the [Overview of Cisco Unified Communications Call Routing, page 7-1](#).

- Call Control

This layer enables users to initiate and manage calls. It includes components that provide the following functions and capabilities:

- Integration with central Lightweight Directory Access Protocol (LDAP) directories enables companies to centralize all user information in a single repository available to Unified Communications applications, with a reduction in maintenance costs through the ease of adds, moves, and changes.
- Access to media resources provides media processing functions such as conferencing, media termination, transcoding, echo cancellation, signaling, packetization of a stream, streaming audio (annunciation), and so forth.
- Music on hold provides music (or advertising) to callers when their call is placed on hold, transferred, parked, or added to an ad-hoc conference.
- Unified Communications endpoints and feature sets range from gateways that support ordinary analog phones in an IP environment to an extensive set of native IP phones offering a range of capabilities for the end user.
- Device mobility features enable mobile users to roam from one site to another with their endpoint devices and to acquire the dynamically allocated settings of their roaming site for call routing, codec selection, media resource selection, and so forth.

- Applications embedded in the call control software provide features such as click-to-call dialing, manager-assistant applications, and the ability for users to log in to any phone, as well as support for web-based applications that can run directly on the user's desktop phone.

For more information on the Call Control layer, see the [Overview of Cisco Unified Communications Call Control, page 15-1](#).

- Applications and Services

This layer contains numerous applications and services that can be deployed on top of an existing Cisco Unified Communications infrastructure to add enhanced user features to the system. It includes components that provide the following functions and capabilities:

- Voice messaging provides voicemail services and message waiting indication.
- Rich media conferencing provides audio and video conferencing as well as web-based application and document sharing.
- Presence services provide user availability tracking across user devices and clients.
- Mobility services provide enterprise-level Unified Communications features and functionality to users outside the enterprise.
- Contact center applications provide call handling, queuing, and monitoring for large call volumes.
- Collaboration client services provide integration to Unified Communications services and leveraging of various applications.

For more information on the Applications and Services layer, see the [Overview of Cisco Unified Communications Applications and Services, page 20-1](#).

- Operations and Serviceability

This layer contains system-level services for monitoring and managing the Unified Communications network and applications. It includes components that provide the following functions and capabilities:

- User and device provisioning services provide centralized provisioning and configuration of users and devices for Unified Communications applications and services.
- Voice quality monitoring and alerting provide the ability to monitor various call flows within the system to determine whether voice quality is acceptable and to alert administrators when the voice quality is not acceptable.
- Operations and fault monitoring provides the ability to monitor all application and service operations and to issue alerts to administrators regarding network and application failures.
- Network and application probing provides the ability to probe and collect network and application traffic information at various locations throughout the deployment and to allow administrators to access and retrieve this information from a central location.

For more information on the Operations and Serviceability layer, see the [Overview of Cisco Unified Communications Operations and Serviceability, page 27-1](#).

**Note**

The design recommendations in this guide have been reviewed and found to be consistent with the Cisco Borderless Network Smart Business Architecture (SBA). Contact your Cisco representative for more information on SBA.

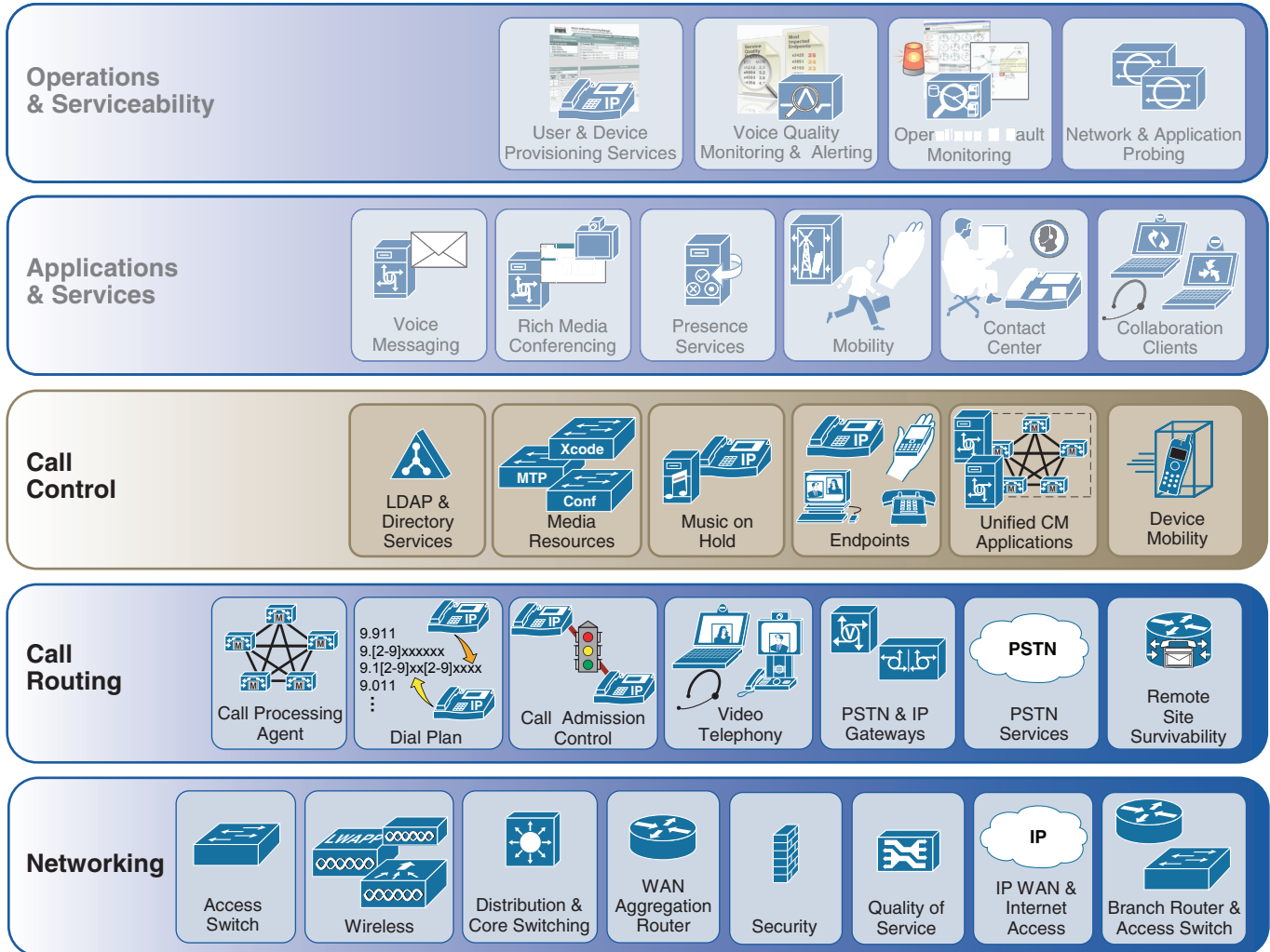
How to Use This Design Guide

This document provides design considerations, guidelines, and best practices for deploying a Cisco Unified Communications System. As discussed in the previous section, the architecture of the Cisco Unified Communications System consists of five layers. This document is divided into five parts corresponding to the five architectural layers. Each part of this document contains chapters that describe the components and design guidelines for the corresponding architectural layer.

The process for building a good Unified Communications system is similar to building a house: first you have to establish a solid infrastructure and foundation upon which to build all the other layers. And the other layers must be added in a particular sequence, usually from the bottom up. (For example, you have to build the walls of a house before you can put a roof on it.) In the case of a Unified Communications system, the networking layer provides the infrastructure, and the other layers must be added from the bottom up in the sequence shown in [Figure 1-1](#). The parts and chapters of this guide are organized in that same sequence to help you establish a logical process for designing your Unified Communications system.

The first chapter in each part of this guide presents an overview of the information contained in that part. The overview includes an illustration of the five architectural layers of the Cisco Unified Communications System, and the layer being discussed in that part of the guide is highlighted. For example, [Figure 1-2](#) is the illustration from the Call Control part of this guide. The Call Control layer is highlighted in a different color to show that it is the layer being discussed in that part of the guide. The layers below it (Networking and Call Routing) are visible because they must already be in place before the Call Control layer can be implemented. The layers above it (Applications & Services and Operations & Serviceability) are shaded to indicate that they cannot be implemented until the current layer (Call Control in this example) is in place.

Figure 1-2 Cisco Unified Communications Call Control Architecture



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If you are designing a new Unified Communications system, Cisco recommends that you develop your design according to the sequence and guidelines presented in this document. If you already have some layers of the system in place and you want to add other layers to it, Cisco recommends that you at least review the sections of this guide that pertain to the existing layers to ensure that your system complies with all the guidelines.

