



# Design

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## Introduction to Design

Using the project plan that was developed in the Plan phase, your team can develop a detailed design for each site and the entire network. In the network design include, at a minimum:

- Routing and switching component connectivity
- Software applications and configurations for routers and switches
- Power and environment

For each site, also include phone circuitry, equipment racks with cabinet locations, and layouts. Encompass your network call processing, conferencing, and messaging requirements in the design of each site. Make the design scalable for future growth.

### Before You Begin

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

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

### When You Are Done

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

- Network diagrams: see [Network Topology Diagrams](#) for editable Microsoft Visio network drawings
- Routing strategy
- Redundancy
- Call flows
- Traffic flows
- Equipment list
- Bill of materials

### Major Concepts and Tasks in This Process

Go directly to the main design concepts and tasks:

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

## Design Concepts

Read these topics for the background knowledge to build an intelligent design.

- [Solution Reference Network Design Documents](#)
- [Using Design Tools and Templates](#), on page 2

## Solution Reference Network Design Documents

Solution Reference Network Design (SRND) documents provide guidelines, recommendations, and best practices for implementing collaboration network solutions. The SRNDs recommended for designing Cisco Collaboration Systems are available from the: [Cisco Collaboration Solutions Design Guidance](#) document or at <http://www.cisco.com/go/srnd>.



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**Note**

Another SRND resource is [Enterprise QoS System Reference Network Design](#).

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## 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](http://docwiki.cisco.com/wiki/Unified_Communications_System_Design)

## Design Tasks

This list is an overview of tasks for designing Collaboration Systems and is not meant to represent an ordered sequence of tasks.

### Identify the Components That You Need

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

- [Collaboration Overview](#)—Describes the primary Cisco software components in Collaboration Systems.
- [Component Resources Documentation for Collaboration](#)—Lists the component documentation.
- [Cisco Collaboration Systems Release Compatibility Matrix](#)—Provides tables that identify the compatible software release versions for each product in each Cisco Collaboration Systems Release.
- [Cisco Interoperability Portal](#)—Provides information about configuring Cisco technologies with third-party products and lists features that interoperate between Cisco solutions and other vendors.

The components that can be installed and configured in Collaboration environments are divided in categories as described in the table.

**Table 1: Component Categories and Descriptions**

Category	Description
Call Control Components	<p>Call control components extend enterprise and midmarket telephony features and capabilities to packet telephony network devices such as IP phones, media processing devices, Voice over IP (VoIP) gateways, and multimedia applications. More services, such as unified messaging, multimedia conferencing, collaborative contact centers, and interactive multimedia response systems, are made possible through open telephony APIs.</p> <p>Cisco Unified Communications Manager is an example of a call control component.</p>
Conferencing Components	<p>Conferencing components provide integrated voice, video, and web conferencing capabilities to enable remote meetings that are natural and effective with face-to-face quality, such as meetings, training sessions, and presentations.</p> <p>Some examples of these components are Cisco TelePresence Server and Cisco WebEx Meetings.</p>
Enterprise Edge Components	<p>Some examples of these components are Cisco TelePresence Video Communication Server and Cisco Expressway Series.</p>

Server Application Components	<p>Server application components are customized applications that help you streamline business processes and drive productivity through Internet Protocol (IP)-based Unified Communications. These components enable the rapid development, reliable execution, and automated management of applications that integrate voice and video with enterprise and midmarket applications and data.</p> <p>Some examples of these components are Cisco Emergency Responder, Cisco Unified Attendant Consoles, and Cisco Paging Server.</p>
Cloud Application Components	<p>Some examples of these components are Cisco WebEx Meetings Server and Cisco WebEx Meeting Center.</p>
Voicemail and Messaging Components	<p>Voicemail and messaging components deliver powerful voice, integrated, and unified messaging options. They scale to meet the needs of large, multisite organizations and offers extensive personalization options, a broad range of productivity enhancing features, and powerful migration tools, including:</p> <ul style="list-style-type: none"> <li>• Interoperability with existing voice messaging and telephony systems</li> <li>• Custom keypad mapping of the telephony interfaces</li> <li>• Integrated context-sensitive help</li> </ul> <p>An example of these components is Cisco Unity Connection.</p>

Endpoint Components	<p>Endpoint components integrate the management capabilities of IP-based networks with phones, pagers, and computers and use these for signaling, voice communications, and data communications.</p> <p>Some examples of these components are Cisco DX Series, Cisco IP Phones, and Cisco TelePresence IX5000.</p>
Service Management Components	<p>Service management components provide an integrated view of the entire Cisco Collaboration Systems and present the current operational status of each element of the IP communications network. In addition, these components provide a low-cost, reliable method of monitoring and evaluating the quality of calls and diagnosing issues.</p> <p>Some examples of these components are Cisco Prime Collaboration Provisioning, Cisco Prime Collaboration Assurance, and Cisco Prime Collaboration Deployment.</p>
Communication Gateway Components	<p>Communication gateway components are network routers, switches, software, and other standards-based networking components that provide reliable connectivity that is more resilient and enables all the latest network services.</p>

## 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 Site Models

Cisco has developed various site models as standard architectures. These models were tested and optimized for maximum efficiency and performance. To derive your network design, choose the deployment model that most closely matches your business. Then add the specific features and applications that meet your business needs. Review the following information.

- [Collaboration Tested Deployments and Site Models](#)

## Review System Caveats

System caveats describe unexpected behavior, defects, and product limitations discovered during system-level testing of collaboration components.

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

## Develop Traffic Engineering Specifications

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

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

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

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

## Define Security Policies

Refer to security policies in these guides:

- [Cisco Unified Communications Manager Security Guide](#)
- To find specific component documents, see [Product Documentation](#) in the Collaboration System Release Notes for Cisco Collaboration Systems Release 11.0(1).

More IP security information is included here for your reference:

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

## Design for High Availability

Cisco Enterprise systems are designed for high availability. In order to achieve high availability, the design must include redundancy for failover and rapid recovery.

For recommendations and design assistance from Cisco Advanced Services, see [Navigating the Road to Five Nines](#).

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

**Note**

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The information in this topic applies to multiple Unified Communications Manager server clusters in a large enterprise environment and does not apply to Cisco Business Edition.

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### Unified Communications Manager Clusters

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

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

### Unified Communications Manager Redundancy Groups

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

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



## Keepalive Mechanism

A keepalive mechanism is an essential part of an Enterprise solution. Keepalives ensure that endpoints (typically phones and gateways) retain their communications path to a Unified Communications Manager server. Keepalives determine when the primary Unified Communications Manager server is no longer available. Keepalives also determine when the site has become isolated from a centralized call control system and must revert to a remote survivability capability such as Unified SRST. Keepalives avoid delays in establishing a call caused by searching for an available Unified Communications Manager server.

