



# 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.

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 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](#)
- [Prepare to Configure Components](#)

- [Preparing Your Network for Troubleshooting and Recovery](#)
- [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

For pricing and ordering guides for Cisco Unified Communications products, see [Ordering Guides](#) in the Resource Library.

### Solution Expert Tool

Solution Expert is a web-based tool that assists in the design, configuration, quoting, and ordering of Cisco Unified Communications products. Solution Expert is available for Cisco sales and partner systems engineers with Unified Communications specializations.

With the Solution Expert tool, users can generate a recommended solution based on their requirements. Users can modify the recommended configuration if desired. Solution Expert validates any changes when it presents the new solution. Solution Expert also generates a bill of materials with list pricing, a Visio diagram, and other design documentation. To access Solution Expert, go to the following URL. For an overview of how to use the tool, see the introductory PDF on the home page.

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

## Install and Configure System Components

### Installation Overview

Create a site-specific installation plan for the implementation team. Describe what needs to be installed and which network points should be tested. Do not describe how to install the hardware and software. This plan should reference product-specific installation guides for descriptions on how to install. This plan will help in managing timelines for implementing equipment and scheduling outages. Include the installation schedule, as well as the test plan, in order to verify that the operation conforms to the design objectives.

This topic contains two sections that provide source information for installing and configuring new systems:

- [Installation and Configuration Checklists](#) provides checklists for installing and configuring some of your contact center components.
- [Component Installation and Configuration Guides](#) provides a complete list of components and links to related installation and configuration documents.

For a list of links to information on components that are used in the contact center environment, see the [Component Resources](#) topic in the Resource Library.

## 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 CallManager 5.0\(4\)](#)
- [IPCC Installation and Configuration Guide for Cisco IPCC Enterprise Edition](#) (right-click to download PDF)
- [System IPCC Enterprise Installation and Configuration Guide](#) (right-click to download PDF)
- [Cisco IPCC Gateway Deployment Guide ICM/IPCC Enterprise Edition](#) (right-click to download PDF)
- Customer Response Solutions (Unified IP IVR)
  - [Getting Started with Cisco IP IVR Cisco Customer Response Solutions](#) (right-click to download PDF)
  - [Cisco Customer Response Solutions Installation Guide](#) (right-click to download PDF)
- [Cisco Customer Voice Portal \(CVP\) Configuration and Administration Guide](#) (right-click to download PDF)

## Component Installation and Configuration Guides

This topic contains a list of the contact center components and where to find the installation and configuration guides for the components. This information includes component names, related hardware and software, and related documentation.

This list includes links to component-level documentation that you will need to install and configure your contact center system:

- [Cisco Unified CallManager](#)
- [Cisco Unified Intelligent Contact Management](#)
- [Cisco Customer Response Solutions](#)
- [Cisco Unified Customer Voice Portal](#)
- [Cisco Agent Desktop](#)
- [Cisco Telephony Integration Object Server](#)
- [Cisco Unified IP Phones](#)
- [Cisco Unity Connection](#)
- [CiscoWorks Management Center for Cisco Security Agent and Cisco Security Agent](#)
- [Cisco Unified Operations Manager](#)
- [Catalyst 3500 Series](#)
- [Catalyst 6500 Series](#)
- [Cisco Content Services Switch](#)

- [Gateways/Gatekeepers](#)
- [Routers](#)

[Tested Call Flows](#) contains tables of configuration tasks for setting up call flows.

## Prepare to Configure Components

### Before You Begin

Components for your application are installed and ready to configure. Refer to product-level documents for configuring the various components. See [Components Configuration](#) to determine your requirements.

### 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

## Component Compatibility and Interoperability

Use the links provided in the following URL 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.

[http://www.cisco.com/univercd/cc/td/doc/product/voice/ip\\_tele/miscres.htm](http://www.cisco.com/univercd/cc/td/doc/product/voice/ip_tele/miscres.htm)

## Contact Center Release Notes

For specific information on the product software versions used, including Service Releases, Hotfixes, and Engineering Specials, see the [System Release Notes for Contact Center: Cisco Unified Communications System, Release 5.0\(2\)](#).

## Call Flow Configuration Commands

Sample configuration commands for components that are involved in the call flows are in [Call Flow Components Configuration Commands](#).

Downloadable zip files containing configurations for all test bed components are in [Configuration Command Files](#) in the Resource Library.

# Introduction to Troubleshooting

This section describes how to develop a system-level troubleshooting methodology as you install and configure a Cisco Unified Communications network for the first time. It also provides recommendations for preparing and documenting the network that may assist you in diagnosing and isolating problems when they occur.

## System Troubleshooting Methodology

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

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

## Gather Information on the Problem

In a contact center network, 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 4-1](#) lists recommended questions to ask users when they report a problem. As you turn up your network, you may consider putting these questions in an on-line form. A form will encourage users to provide more details about the problem and also put them into the habit of looking for particular error messages and indicators. Capturing the information electronically will also permit you to retrieve and re-examine this information in the future, should the problem repeat itself.

**Table 4-1** Questions to Ask Users When They Report Problems

<b>Ask this Question...</b>	<b>To Determine...</b>
<b>Did something fail or did it simply perform poorly?</b>	Whether the issue relates to system degradation or a connectivity failure. An example of a failure is when a user dials a phone number and hears fast busy tone. An example of a performance problem is when a user dials into a conference call and hears “choppy” audio when other parties speak. Quality of service or performance issues require a different approach than connectivity or operational problems. You must still isolate the potential sources of the problem, but you will typically use performance management tools instead of log files.
<b>What device were you trying to use?</b>	The device type, model and version of software installed. It is also critical to capture the IP address assigned to the device, as well as its MAC address. In the case of IP phones, determining the phone’s active Cisco Unified CallManager 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.
<b>Did it ever work?</b>	If a device was recently installed and the problem occurred while making it work for the first time, or if the device was operating normally before the problem occurred. If the device was newly installed, the problem is most likely due to improper configuration or wiring of that particular device. Problems with devices that are already up and running can typically be traced back to one of two causes: (a) the user modifying their device, such as changing their configuration or upgrading software, or (b) a change or failure elsewhere in the network.
<b>Exactly what action(s) did you perform?</b>	The steps that led up to the problem, including which buttons were pressed and in which order. Capturing this information in detail is important so that you can consistently reproduce the problem.
<b>What error message(s) appeared or announcements did you hear?</b>	The visual and audio indicators of the problem. Ask users to provide the exact text that appears and any error codes in either an E-mail or on-line form. If the error indication was audible, ask the user to write down the announcement they heard, the last menu option they were able to successfully choose or the tone they heard when the call failed.

**Table 4-1** Questions to Ask Users When They Report Problems (continued)

Ask this Question...	To Determine...
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 CallManager 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 site/location were you trying to reach?	If the problem relates to a WAN or PTSN link, or a Cisco Unified CallManager dial plan issue. Ask the user the phone number they dialed and determine if the destination was within his or her site, another site within the corporate network, or a PSTN destination.
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 Unified Communications products in your network. These diagrams illustrate how these devices are connected and also capture each device's IP address and name (you may want to also have a spreadsheet or database of the latter information). This information can help you visualize the situation and focus on the devices that may be contributing to the reported problem. See [Network Topology Diagrams](#) for recommendations on how to prepare these diagrams.

- **Call flow diagrams:** Cisco equipment, including Unified CallManager servers, typically provide detailed debug and call trace log files. To interpret these log files, however, it is useful to understand the signaling that occurs between devices as calls are set up and disconnected. Using the network topology and call flow diagrams in conjunction with the log files, you can trace how far a call progressed before it failed and identify which device reported the problem. Examples of using call flow diagrams for problem isolation are shown in [Troubleshooting Daily Operations](#).

### Check Software Release Versions for Compatibility

After you have identified which devices may be involved in the problem, verify that the version of software running on each device is compatible with the software running on every other device. As part of Cisco Unified Communications Release 5.0(2) verification, Cisco Systems has performed interoperability and load testing on simulated network environments running specific software versions. The [Release Matrix](#) lists the combination of software releases that were tested.

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



Tip

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The Bug Toolkit requires that you are a Cisco partner or a registered Cisco.com user with a Cisco service contract. Using the Bug Toolkit, you can find caveats for any release. To access the Bug Toolkit, go to [http://www.cisco.com/cgi-bin/Support/Bugtool/launch\\_bugtool.pl](http://www.cisco.com/cgi-bin/Support/Bugtool/launch_bugtool.pl).

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### 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 contact center network such as:

- New agent phones added
- Modifications to Cisco Unified CallManager call routing settings, such as new directory numbers, route patterns and dial rules to support new sites or devices
- Changes to port configurations on switches, routers or gateways (new equipment, wiring changes or new port activation)
- Changes to IP addressing schemes (such as adding new subnets) that may have affected route tables

### Verify the IP Network Integrity

Always remember that Cisco Unified Communications equipment relies on a backbone IP network. Many connectivity problems are not caused by configuration errors or operational failures on Cisco devices, but rather by the IP network that interconnects them. Problems such as poor voice quality are typically due to IP network congestion, while call failures between locations may be the result of network outages due to disconnected cables or improperly configured IP route tables.

Before assuming that call processing problems result from Cisco Unified Communications devices themselves, check the integrity of the backbone IP network. Keep the OSI model in mind as you perform these checks. Start from the bottom, at the physical layer, by checking that end-to-end cabling. Then

verify the status of Layer 2 switches, looking for any port errors. Move from there to confirm that the Layer 3 routers are running and contain correct routing tables. Continue up the OSI stack to Layer 7, the application layer. To resolve problems occurring at the top levels of the stack, a protocol analyzer (or “sniffer”) may be useful. You can use sniffer to examine the IP traffic passing between devices and also decode the packets. Sniffers are particularly useful for troubleshooting errors between devices that communicate using Media Gateway Control Protocol (MGCP) or Session Initiation Protocol (SIP).

## Apply Tools to Determine the Problem’s Root Cause



After you have eliminated the IP network as the source of the problem and you have isolated the specific Cisco Unified Communications components involved, you can start applying the many diagnostic tools provided by Cisco components.

Table 4-2 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 4-2 Contact Center Component Troubleshooting Tools and Documentation**

Component	Diagnostic Tools Available	Information Available In...
Cisco Agent Desktop (CAD)	Log files: <ul style="list-style-type: none"> <li>• Error/event logs</li> <li>• Agent desktop activity logs</li> <li>• Debugging logs</li> </ul> Test programs: <ul style="list-style-type: none"> <li>• IP Phone Agent Service test program</li> <li>• Voice Over IP Monitor service test program</li> </ul> Support Tools Dashboard (requires additional software)	<a href="#">Support Tools User Guide for ICM/IPCC</a> <a href="#">Support Tools Common Tool Reference Guide for ICM/IPCC</a> <a href="#">Troubleshooting TechNotes</a>
Cisco Unified CallManager	Serviceability System tools: <ul style="list-style-type: none"> <li>• Alarms</li> <li>• Real-Time Monitoring Tool window</li> </ul> Trace log files <ul style="list-style-type: none"> <li>• CallManager trace log</li> <li>• SDL trace log (under TAC direction)</li> </ul>	<a href="#">Troubleshooting Guide for Cisco Unified CallManager</a> <a href="#">System Error Messages for Cisco Unified CallManager</a> <a href="#">Cisco Unified CallManager Serviceability Administration Guide</a> <a href="#">Cisco Unified CallManager Serviceability System Guide</a> <a href="#">Cisco Unified CallManager CDR Analysis and Reporting Administration Guide</a> <a href="#">Disaster Recovery System Administration Guide</a> <a href="#">Troubleshooting TechNotes</a>

**Table 4-2 Contact Center Component Troubleshooting Tools and Documentation (continued)**

Component	Diagnostic Tools Available	Information Available In...
Cisco CSS 11501 Content Services Switch	Log files Error messages appearing on an attached console display	<a href="#">CSS Administration Guide, “Using the CSS Logging Features” chapter</a> <a href="#">Cisco 11501 Series CSS Hardware Installation Guide, “Cabling and Troubleshooting the CSS” chapter</a> <a href="#">Error Message Decoder</a>  <a href="#">Output Interpreter</a>  <a href="#">Troubleshooting TechNotes</a>
Cisco Customer Response Solutions (Unified IP IVR)	Log files Alarms	<a href="#">Cisco Customer Response Solutions Servicing and Troubleshooting Guide</a> <a href="#">Cisco Customer Response Applications Serviceability Guide</a> <a href="#">Troubleshooting TechNotes</a>
Cisco Unified Customer Voice Portal (formerly ISN)	Error messages Alarms Support Tools Dashboard (requires additional software)	<a href="#">Cisco Customer Voice Portal (CVP) Installation Guide, “Troubleshooting CVP Install / Upgrade / Uninstall” section</a> <a href="#">Cisco Customer Voice Portal (CVP) Configuration and Administration Guide, “Troubleshooting” appendix</a> <a href="#">Cisco CVP VoiceXML 3.1 Installation Guide, “Troubleshooting” section</a> <a href="#">Support Tools User Guide for ICM/IPCC</a> <a href="#">Support Tools Common Tool Reference Guide for ICM/IPCC</a> <a href="#">Troubleshooting TechNotes</a>
CTI Object Server (CTIOS)	Log files: <ul style="list-style-type: none"> <li>• CTI OS Server logs</li> <li>• CTI Toolkit logs</li> </ul> Error messages in the CTI OS Server console window Support Tools Dashboard (requires additional software)	<a href="#">CTI OS Troubleshooting Guide for Cisco ICM/IPCC Enterprise and Hosted Editions</a> <a href="#">Support Tools User Guide for ICM/IPCC</a> <a href="#">Support Tools Common Tool Reference Guide for ICM/IPCC</a> <a href="#">Troubleshooting TechNotes</a>

**Table 4-2 Contact Center Component Troubleshooting Tools and Documentation (continued)**

<b>Component</b>	<b>Diagnostic Tools Available</b>	<b>Information Available In...</b>
Cisco Unified Contact Center Enterprise	Log files: <ul style="list-style-type: none"> <li>• Error/event logs</li> <li>• Agent desktop activity logs</li> <li>• Debugging logs</li> </ul> Test programs: <ul style="list-style-type: none"> <li>• Chat Service test program</li> <li>• Enterprise Service test program</li> <li>• IP Phone Agent Service test program</li> <li>• Packet Capture Driver test program</li> <li>• Recording and Statistics Service test program</li> <li>• Sniffing Adapter Update Utility</li> <li>• Voice Over IP Monitor service test program</li> </ul>	<a href="#">System IPCC Enterprise Installation and Configuration Guide, “IPCC Troubleshooting” chapter</a> <a href="#">Configuration and Troubleshooting Guide for Cisco IPCC Remote Agent Option, “Troubleshooting Cisco IPCC Remote Agent Option” chapter</a> <a href="#">Troubleshooting TechNotes</a>
Cisco Unified Intelligent Contact Management Enterprise	Distributed Diagnostics and Services Network (DDSN) Support Tools Dashboard (requires additional software)	<a href="#">ICM Administration Guide for Cisco ICM Enterprise Edition</a> <a href="#">Support Tools User Guide for ICM/IPCC</a> <a href="#">Support Tools Common Tool Reference Guide for ICM/IPCC</a> <a href="#">Troubleshooting TechNotes</a>
Cisco Unified Intelligent Contact Management Hosted	Distributed Diagnostics and Services Network (DDSN) Support Tools Dashboard (requires additional software)	<a href="#">Support Tools User Guide for ICM/IPCC</a> <a href="#">Support Tools Common Tool Reference Guide for ICM/IPCC</a> <a href="#">Troubleshooting TechNotes</a>
Cisco Unity Connection	Cisco Unity Diagnostic Tool (UDT): <ul style="list-style-type: none"> <li>• Macro trace logs</li> <li>• Micro trace logs</li> </ul> CuVrt service verbose logging	<a href="#">Troubleshooting Information and FAQs for Cisco Unity Connection</a> <a href="#">Troubleshooting TechNotes</a>
Cisco Unified Operations Manager	Alarms and events appearing in Dashboard displays Phone status tests Synthetic test Node-to-node tests	<a href="#">User Guides for Cisco Unified Operations Manager</a> <a href="#">Operations Manager Frequently Asked Questions</a>

**Table 4-2** Contact Center Component Troubleshooting Tools and Documentation (continued)

Component	Diagnostic Tools Available	Information Available In...
Cisco Unified IP phones	Network configuration, status and phone model information on Settings menu	<a href="#">End-User Guides</a> <a href="#">Cisco IP Phone Administration Guides for Cisco Unified CallManager, “Troubleshooting and Maintenance” chapters</a> <a href="#">Error Message Decoder</a>  <a href="#">Output Interpreter</a>  <a href="#">Troubleshooting TechNotes</a>
Cisco Catalyst 3550 Access Switch	IOS command line tools (such as Show commands and Debug trace utilities)	<a href="#">Catalyst 3550 Multilayer Switch Software Configuration Guide, “Troubleshooting” chapter</a> <a href="#">Catalyst 3550 Multilayer Switch System Message Guide</a> <a href="#">Catalyst 3550 Multilayer Switch Hardware Installation Guide, “Troubleshooting” chapter for hardware problems</a> <a href="#">Troubleshooting Tips</a> <a href="#">Error Message Decoder</a>  <a href="#">Output Interpreter</a>  <a href="#">Troubleshooting Tech Notes</a>
Catalyst 6506, 6509	IOS command line tools (such as Show commands and Debug trace utilities)	<a href="#">Catalyst 6500 Series Error and System Message Guides</a> <a href="#">Catalyst 6500 Series Switch and Cisco 7600 Series Router Firewall Services Module Logging Configuration and System Log Messages</a> <a href="#">Troubleshooting Tips</a> <a href="#">Error Message Decoder</a>  <a href="#">Output Interpreter</a>  <a href="#">Troubleshooting TechNotes</a>

## Preparing Your Network for Troubleshooting and Recovery

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

- Produce network topology diagrams to help you isolate potential sources of problems.
- Synchronize the date and time on all servers.

- Set trace/logging levels on key devices so that diagnostic information is available when problems occur.
- 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 CallManager cluster
  - DHCP address range for addresses assigned to endpoints such as IP phones and agent workstations
- Phone extension number ranges assigned to sets of agents or users, as well as the main inbound dial-up numbers for each location. This information is useful in resolving dial plan configuration errors.
- WAN IP and PSTN links between sites.

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



### Tip

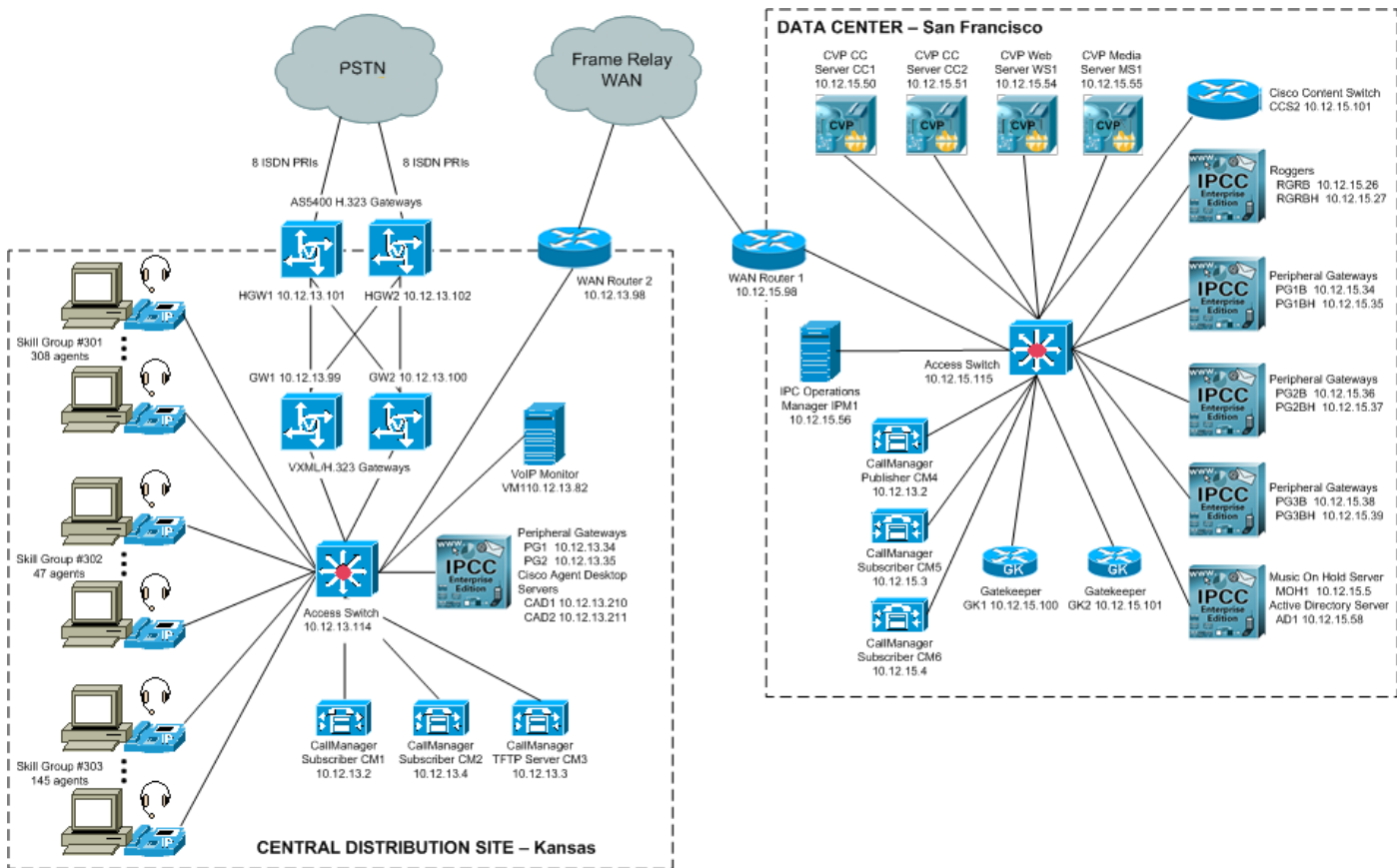
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Frequent adds, changes and upgrades to your network can quickly make these diagrams out-of-date. Inaccurate diagrams slow down the troubleshooting process and may lead to misdiagnosing the problem. Remember to keep these diagrams as current as possible.

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Figure 4-1 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 4-1 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 [Cisco IOS Configuration Fundamentals Command Reference](#) for details on these IOS commands.

## Recommended Trace/Logging Settings

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

### Cisco Unified CallManager Trace Settings

Trace settings for Cisco Unified CallManager servers are maintained using the Cisco CallManager Serviceability graphical interface. There are two ways to set trace logging levels for Unified CallManager 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 CallManager 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 CallManager Serviceability Administration Guide, “Trace Configuration” chapter](#).
- **Apply predefined trace levels:** This approach allows you to quickly enable and disable tracing for each Unified CallManager 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 CallManager Serviceability interface, see the [Cisco Unified CallManager Serviceability Administration Guide, “Troubleshooting Trace Setting Configuration” chapter](#).

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

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

- For CRS issues: SS\_TEL, SS\_ICM, and LIB\_ICM.
- For JTAPI Client issues: Enable all Trace Levels and select all debug levels except MISC\_DEBUGGING.

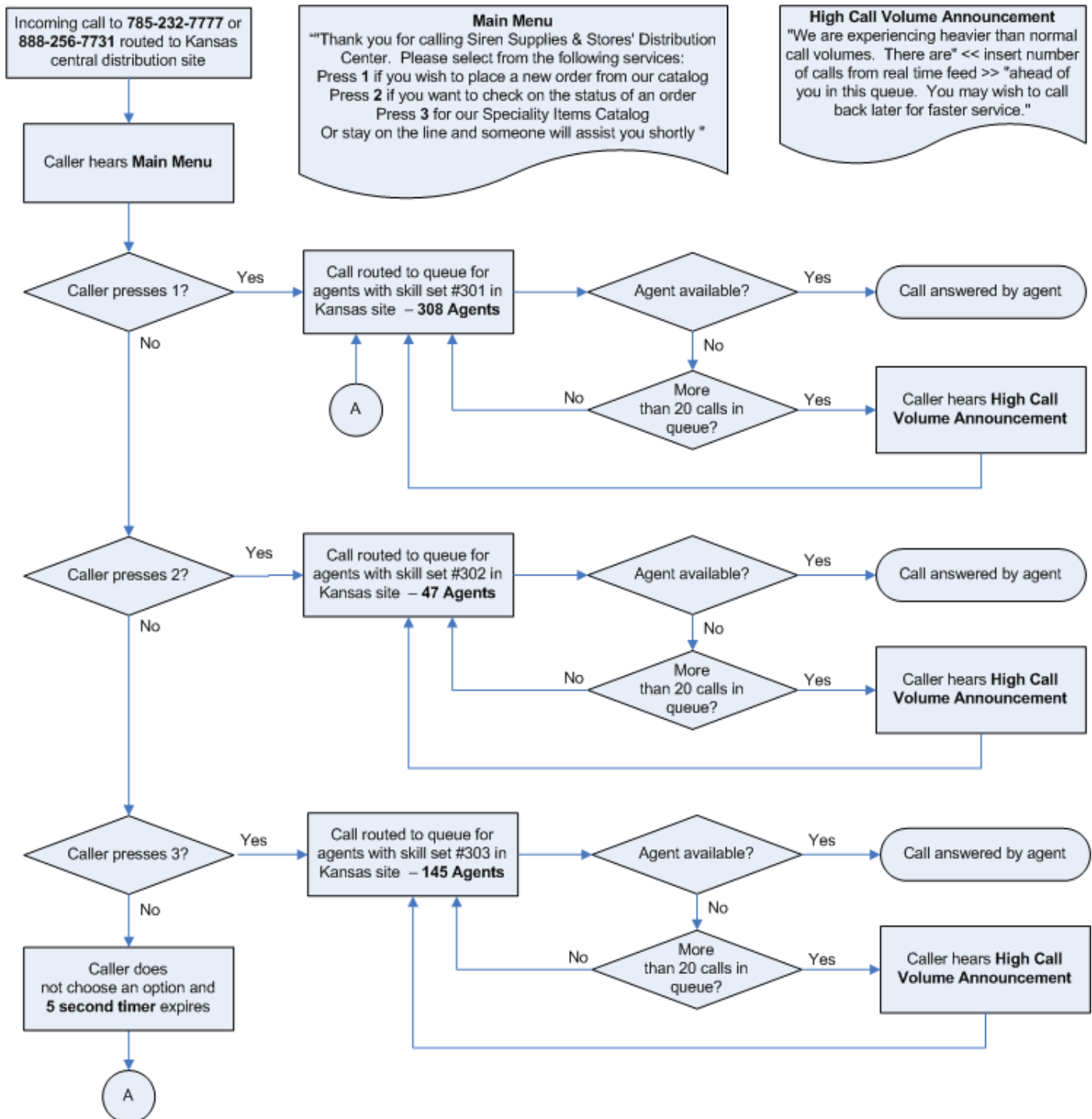
However, deactivate the above trace settings if you experience any degradation in performance during heavy load situations.

## 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 4-2](#) 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 4-2](#) 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 4-2 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 Implementation 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 [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 Unified Communications process flows.

Advanced Services is a Cisco service offering that provides engineering expertise and best practices.

- Registered users can visit the [Advanced Services](#) resource site.
- Nonregistered users can visit the [Advanced Services](#) external site.

## Related Training

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

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

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

For more Cisco Unified Communications training videos, see the [Training Library](#).

