



Solution Architecture Reference Manual for IPT

IP Communications Systems Test Release 2.0

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Preface ix

Overview **ix**

Audience **ix**

Organization **x**

Obtaining Documentation **xi**

 Cisco.com **xi**

 Ordering Documentation **xi**

Documentation Feedback **xii**

Obtaining Technical Assistance **xii**

 Cisco TAC Website **xii**

 Opening a TAC Case **xiii**

 TAC Case Priority Definitions **xiii**

Obtaining Additional Publications and Information **xiv**

CHAPTER 1

Tested Scenarios and Site Models 1-1

Purpose of Solution Tests **1-1**

Overview of Test Scenarios **1-2**

 Single Site Scenario **1-3**

 Multi-Site Centralized Scenario **1-4**

 Multi-Site Distributed Scenario **1-6**

Site Models for the Test Scenarios **1-8**

 Very Large Site Model **1-9**

 Large Site Model **1-13**

 Medium Site Model **1-16**

Small Site Model 1-17
 Central Site Model 1-19
 Remote Site Models 1-21

CHAPTER 2

Cisco CallManager Configuration 2-1

Cisco CallManager System Configuration 2-2
 System > Server Configuration 2-2
 System > Cisco CallManager Configuration 2-3
 System > Cisco CallManager Group 2-4
 System > Region 2-6
 System > Device Pool 2-6

Cisco CallManager Route Plan Configuration 2-8
 Route Plan > Partition 2-8
 Route Plan > Calling Search Space 2-9
 Route Plan > Route Group 2-10
 Route Plan > Route List 2-11
 Route Plan > Route Pattern 2-12
 Route Plan > Translation Pattern 2-13

Cisco CallManager Service Configuration 2-15
 Service > Media Resource > Conference Bridge 2-15
 Service > Media Resource > Media Termination Point 2-16
 Service > Media Resource > Music On Hold Audio Source 2-17
 Service > Media Resource > Music On Hold Server 2-17
 Service > Media Resource > Transcoder 2-18
 Service > Media Resource > Media Resource Group 2-19
 Service > Media Resource > Media Resource Group List 2-20
 Service > Service Parameters 2-21

Cisco CallManager Feature Configuration 2-22
 Feature > Call Park 2-23
 Feature > Cisco IP Phone Services 2-24

- Feature > Voice Mail > Cisco Voice Mail Port 2-24
- Feature > Voice Mail > Message Waiting 2-25
- Feature > Voice Mail > Voice Mail Pilot 2-26
- Feature > Voice Mail > Voice Mail Profile 2-27
- Cisco CallManager Device Configuration 2-27
 - Device > CTI Route Point 2-28
 - Device > Gatekeeper 2-30
 - Device > Gateway 2-30
 - Device > Phone 2-35
 - Device > Trunk 2-39
 - Device > Device Settings > Device Profile 2-42
- Cisco CallManager User Configuration 2-44

CHAPTER 3**Cisco Personal Assistant Configuration 3-1**

- Cisco Personal Assistant System Configuration 3-2
 - System > Speech Services 3-2
 - System > Telephony 3-3
 - System > Messaging 3-4
 - System > Enhanced TTS 3-5
- Cisco Personal Assistant Server Configuration 3-6

CHAPTER 4**Cisco Emergency Responder Configuration 4-1**

- Cisco Emergency Responder CER Groups 4-2
 - CER Groups > CER Group Settings 4-2
 - CER Groups > Telephony Settings 4-3
- Cisco Emergency Responder ERL 4-3
- Cisco Emergency Responder Phone Tracking 4-4

CHAPTER 5

Cisco Unity and Cisco Unity Bridge Configuration 5-1

Cisco Unity and Cisco Unity Bridge Topology 5-2

Cisco Unity Configuration 5-3

Cisco Unity Bridge Configuration 5-4

CHAPTER 6

Cisco Customer Response Applications Configuration 6-1

Overview 6-2

Cisco CallManager Configuration for Cisco CRA System 6-3

CSQ Configuration 6-3

Workflows for IVR Menu Choices 6-5

 Computing Hardware and Operating System Support 6-6

 Standard Desktop Software Support 6-6

 Financial and Trading Application Support 6-6

 Reporting Application Support 6-7

 Network and Password Support 6-7

 Executive System Support 6-7

CHAPTER 7

Hardware Configurations 7-1

Cisco 3660 Gatekeeper Configuration 7-1

 GK1 Configuration 7-2

 GK2 Configuration 7-3

Cisco 3745 CAMA Gateway Configuration 7-5

CHAPTER 8

Fax, Modem, and TTY/TDD Configurations 8-1

Overview 8-1

Fax/Modem Pass-Through/Up Speed Configuration 8-2

 H.323 Fax/Modem Pass-Through Configuration 8-3

 MGCP Fax/Modem Pass-Through Configuration 8-8

- Fax Relay Configuration 8-10
 - H.323 Fax Relay Configuration 8-11
 - MGCP Fax Relay Configuration 8-16

CHAPTER 9**Quality of Service Configuration 9-1**

- Cisco Catalyst 6506 Switch Configuration 9-1
- Cisco 3725 Router Configuration 9-8
- Cisco 7206 Router Configuration 9-15

CHAPTER 10**Call Flow 10-1**

CHAPTER 11**Troubleshooting 11-1**

- Troubleshooting IPT Scenarios 11-1
 - Intercluster Trunk Calls with Gatekeepers Fail 11-1
 - Site-to-Site IP Calls Fail 11-2
- General Troubleshooting Tips 11-3
- Additional Troubleshooting Resources 11-4

CHAPTER 12**Failure, Failover, and Recovery 12-1**

- Cisco CallManager Failover Testing 12-1
 - Test 1: Shut Down Primary Cisco CallManager Server 12-2
 - Test 2: Disconnected Cable from Primary Cisco CallManager Server 12-3
 - Test 3: Failback 12-3
- Cisco Unity Failover Testing 12-3
 - Test 1: Failed the Primary Cisco CallManager 12-4
 - Test 2: Stopped Cisco Unity Services 12-4
 - Test 3: Disconnected Network Cable 12-5
 - Test 4: Failback 12-5

CHAPTER 13

Call Load Testing 13-1

Very Large Site Call Load Testing 13-1

Large Site Call Load Testing 13-3

Medium Site Call Load Testing 13-5

Small Site Call Load Testing 13-7

Central Site and Remote Sites Call Load Testing 13-8

INDEX



Preface

Overview

Solution Architecture Reference Manual for IPT describes the components and configurations that have been tested and verified as part of IP Communications Systems Test Release 2.0 for Internet Protocol Telephony (IPT). This manual also includes related information for call flows, troubleshooting, failover behavior, and call load testing.

Audience

This manual is intended for system administrators who are familiar with the various hardware and software components that are included in IP Communications Systems Test Release 2.0 and that are discussed in this manual. It assumes that readers have the technical and product knowledge to install, configure, manage, and troubleshoot the systems described.

Organization

This manual is organized as follows:

| | |
|---|---|
| Chapter 1, “Tested Scenarios and Site Models” | Describes the tested IPT site scenarios and the site models that make up these scenarios; includes lists of the hardware and software components in each site model |
| Chapter 2, “Cisco CallManager Configuration” | Provides an overview of how Cisco CallManager was set up for the Very Large Site model |
| Chapter 3, “Cisco Personal Assistant Configuration” | Provides an overview of how Cisco Personal Assistant was set up for the Very Large Site model |
| Chapter 4, “Cisco Emergency Responder Configuration” | Provides an overview of how Cisco Emergency Responder was set up for the Very Large Site model |
| Chapter 5, “Cisco Unity and Cisco Unity Bridge Configuration” | Provides an overview of how Cisco Unity and Cisco Unity Bridge were set up for the Very Large Site model |
| Chapter 6, “Cisco Customer Response Applications Configuration” | Provides an overview of how Cisco Customer Response Applications was set up for the Very Large Site model |
| Chapter 7, “Hardware Configurations” | Provides sample configuration information for a gatekeeper and a gateway |
| Chapter 8, “Fax, Modem, and TTY/TDD Configurations” | Provides an overview of how gateway devices were configured for fax/modem pass-through and fax relay modes |
| Chapter 9, “Quality of Service Configuration” | Provides sample Quality of Service configuration files |
| Chapter 10, “Call Flow” | Describes a selected call flow |
| Chapter 11, “Troubleshooting” | Provides guidance and resources for diagnosing and correcting errors |

| | |
|---|--|
| Chapter 12, “Failure, Failover, and Recovery” | Provides an overview of failover testing |
| Chapter 13, “Call Load Testing” | Describes results of load testing |

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For P1 or P2 cases (P1 and P2 cases are those in which your production network is down or severely degraded) or if you do not have Internet access, contact Cisco TAC by telephone. Cisco TAC engineers are assigned immediately to P1 and P2 cases to help keep your business operations running smoothly.

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Asia-Pacific: +61 2 8446 7411 (Australia: 1 800 805 227)

EMEA: +32 2 704 55 55

USA: 1 800 553-2447

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- *Cisco Press* publishes a wide range of general networking, training and certification titles. Both new and experienced users will benefit from these publications. For current Cisco Press titles and other information, go to Cisco Press online at this URL:

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configuration examples, customer case studies, tutorials and training, certification information, and links to numerous in-depth online resources. You can access Packet magazine at this URL:

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- *iQ Magazine* is the Cisco bimonthly publication that delivers the latest information about Internet business strategies for executives. You can access iQ Magazine at this URL:

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- *Internet Protocol Journal* is a quarterly journal published by Cisco Systems for engineering professionals involved in designing, developing, and operating public and private internets and intranets. You can access the Internet Protocol Journal at this URL:

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Tested Scenarios and Site Models

This chapter describes the following Internet Protocol Telephony (IPT) site scenarios that were tested and verified as part of IP Communications Systems Test Release 2.0 for IPT:

- Single Site scenario
- Multi-Site Centralized scenario
- Multi-site Distributed scenario

Each scenario is composed of one or more site models, which this chapter also describes.

This chapter includes the following topics:

- [Purpose of Solution Tests, page 1-1](#)
- [Overview of Test Scenarios, page 1-2](#)
- [Site Models for the Test Scenarios, page 1-8](#)

Purpose of Solution Tests

An efficient, effective, and reliable IPT solution requires many interrelated hardware and software components. The Single Site, Multi-Site Centralized, and Multi-Site Distributed scenarios described in this manual provide you with models and guidance as you implement an IPT system for your organization. For each scenario, Cisco has selected, installed, configured, and tested hardware and software designed to work together seamlessly and to provide a complete and optimized IPT solution.

Each scenario and test addresses the following issues:

- End-to-end functionality
- Operability in a real-world environment
- Scalability
- Stability
- Stress
- Load
- Redundancy
- Reliability
- Usability
- Availability
- Installability
- Upgradeability
- Serviceability
- Regression

Overview of Test Scenarios

The following sections describe the IPT site scenarios that were tested and verified as part of IP Communications Systems Test Release 2.0 for IPT:

- [Single Site Scenario, page 1-3](#)
- [Multi-Site Centralized Scenario, page 1-4](#)
- [Multi-Site Distributed Scenario, page 1-6](#)

Single Site Scenario

A Single Site scenario consists of a Cisco CallManager located at a single site or campus, with no telephony services provided over an IP WAN. A LAN or a metropolitan area network (MAN) carries voice traffic throughout the site. If an IP WAN is used, it is for data traffic only. Calls beyond the LAN or MAN use the public switched telephone network (PSTN).

A Single Site scenario can consist of any one of these site models:

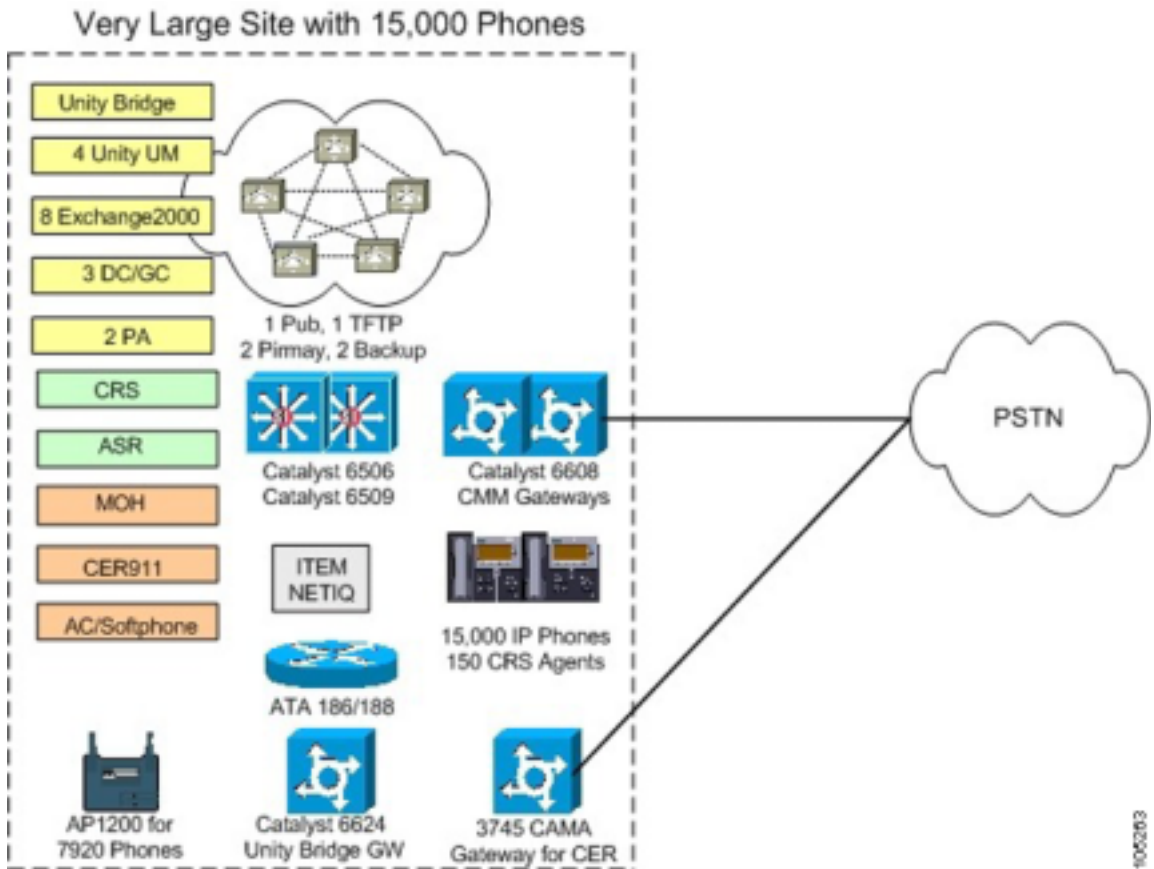
- Very Large Site model. For more information, see the [“Very Large Site Model” section on page 1-9](#).
- Large Site model. For more information, see the [“Large Site Model” section on page 1-13](#).
- Medium Site model. For more information, see the [“Medium Site Model” section on page 1-16](#).
- Small Site Model. For more information, see the [“Small Site Model” section on page 1-17](#).

The tested Single Site scenarios have the following design characteristics:

- Support for up to 15,000 phones at a very large site, 3,000 phones at a large site, 1,000 phones at a medium site, or 500 phones at a small site
- Cisco CallManager cluster for redundancy and system scaling

[Figure 1-1](#) provides an overview of the Single Site scenario (Very Large Site model).

Figure 1-1 Single Site Scenario (Very Large Site Model)



Multi-Site Centralized Scenario

A Multi-Site Centralized scenario consists of a multi-site IP WAN with centralized call processing. In this scenario, a single Cisco CallManager cluster provides call processing services for multiple remote sites and uses the IP WAN to carry IP telephony traffic between the sites. The IP WAN also carries call control signaling between the central site and the remote sites.

If the centralized site or the IP WAN goes down, remote sites can continue to have service through Survivable Remote Site Telephony (SRST), which runs on Cisco IOS gateways. Remote sites can also place calls over the PSTN if the IP WAN becomes temporarily over-subscribed.

The tested Multi-Site Centralized scenario is composed of one Central Site model and 503 Remote Site models. (For testing purposes, approximately 400 of the Remote Site models were simulated.)

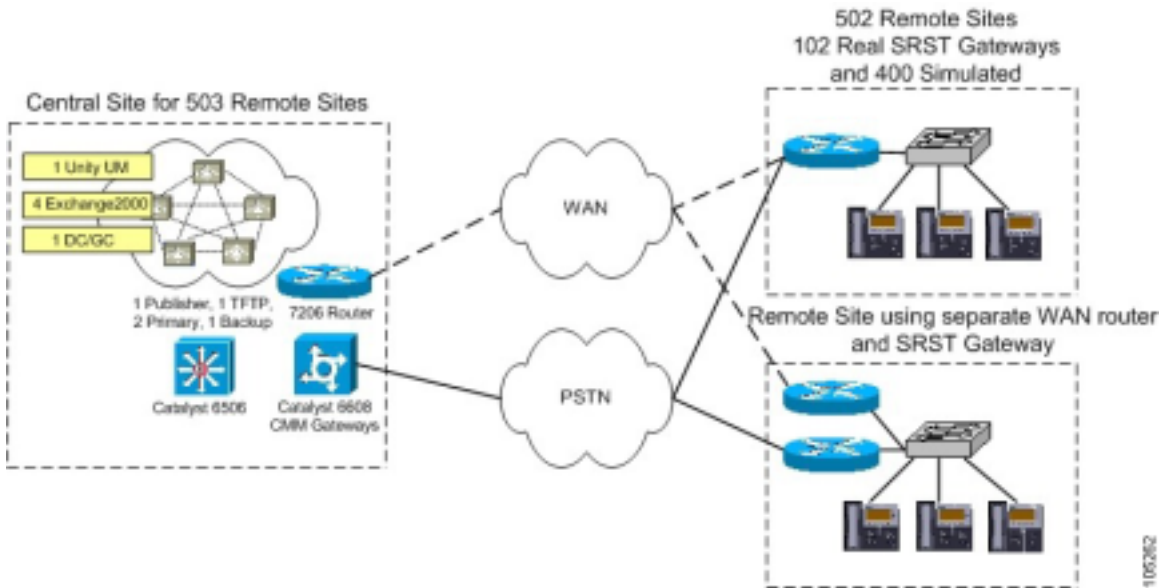
For more information about the Multi-Site Centralized scenario site models, see the [“Central Site Model” section on page 1-19](#) and the [“Remote Site Models” section on page 1-21](#).

The tested Multi-Site Centralized has the following design characteristics:

- Cisco CallManager cluster resides at the central site
- Cisco Unity Unified Messaging resides at the central site
- Cisco Unity with two node Exchange2000
- Cisco Unity ViewMail for Outlook (VMO) in remote sites
- Centralized dial plan and administration
- Call admission control based on locations (to protect voice quality of IP WAN calls)
- SRST for remote sites

[Figure 1-2](#) provides an overview of the Multi-Site Centralized scenario.

Figure 1-2 Multi-Site Centralized Scenario



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Multi-Site Distributed Scenario

A Multi-Site Distributed scenario consists of multiple independent sites, each with its own Cisco CallManager cluster. An IP WAN carries voice traffic between the sites. In this scenario, the IP WAN does not carry call control signaling between the sites because each site has its own call processing agent (Cisco CallManager).

If the IP WAN goes down or becomes temporarily over-subscribed, sites can remain connected through the PSTN.

The Multi-Site Distributed scenario is composed of various Very Large Site models, Large Site models, Medium Site models, and Small Site models.

For more information about the Multi-Site Distributed scenario site models, see the following sections:

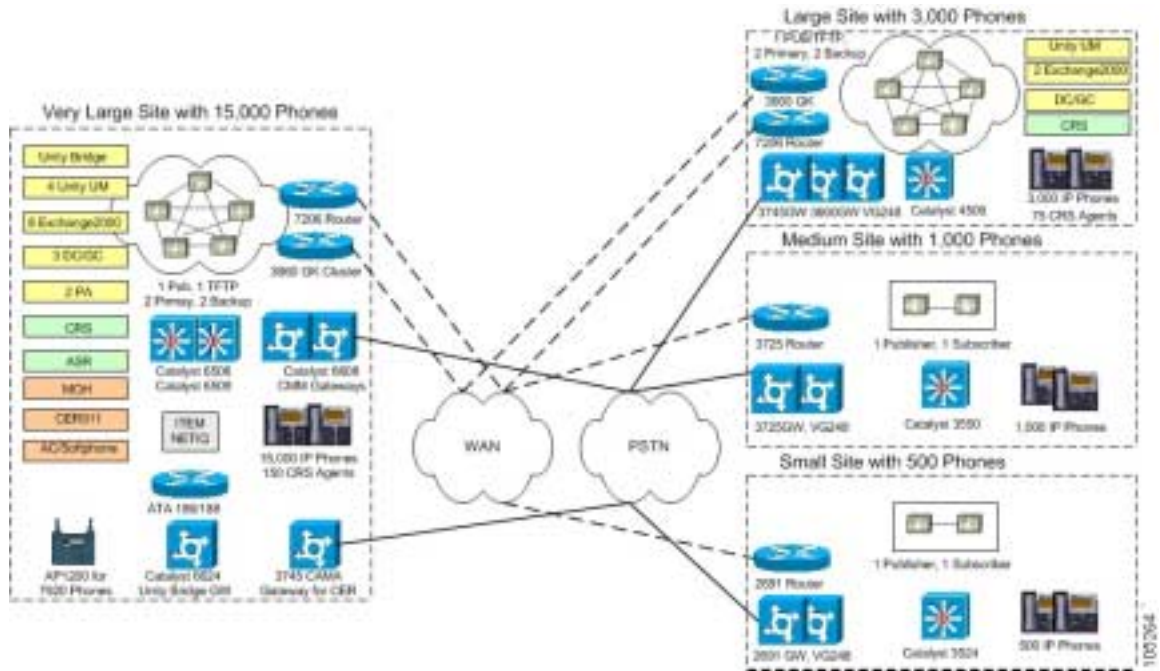
- [Very Large Site Model, page 1-9](#)
- [Large Site Model, page 1-13](#)
- [Medium Site Model, page 1-16](#)
- [Small Site Model, page 1-17](#)

The tested Multi-Site Distributed scenario has the following design characteristics:

- Separate Cisco CallManager clusters reside at each site
- Cisco Unity Unified Messaging resides at each site
- Distributed dial plan and administration
- Call admission control (CAC) based on gatekeeper CAC (to protect voice quality of IP WAN calls)

[Figure 1-3](#) provides an overview of the Multi-Site Distributed scenario.

Figure 1-3 Multi-Site Distributed Scenario



Site Models for the Test Scenarios

The following sections describe the site models that were used to create the various test scenarios.

Each section includes a table that lists the hardware and software components used in the model. The tables contain the following information for each component:

- Component—Hardware or software component
- Description—Information such model number, release number, protocol, and hardware platform
- Qty.—Quantity of the component used in the model

Table 1-1 provides an overview of the site models.

Table 1-1 Site Models

| Name | Reference | Description |
|--------------------------------|---|--|
| Very Large Site | See the “Very Large Site Model” section on page 1-9 | Can stand alone as a Single Site scenario or be one of the remote sites in the Multi-Site Distributed scenario |
| Large Site | See the “Large Site Model” section on page 1-13 | |
| Medium Site | See the “Medium Site Model” section on page 1-16 | |
| Small Site | See the “Small Site Model” section on page 1-17 | |
| Central Site | See the “Central Site Model” section on page 1-19 | Location of the Cisco CallManager cluster in the Multi-Site Centralized scenario |
| Remote Site A Remote Site B | See the “Remote Site Models” section on page 1-21 | Remote sites in the Multi-Site Centralized scenario |

Very Large Site Model

The Very Large Site model can stand alone as a Single Site scenario or, with the addition of a WAN router and gatekeepers, it can be one of the remote sites in the Multi-Site Distributed scenario. This model contains approximately 15,000 phones and approximately 150 agents.

[Figure 1-4](#) shows the topology of the Very Large Site model.

Figure 1-4 Very Large Site Model Topology

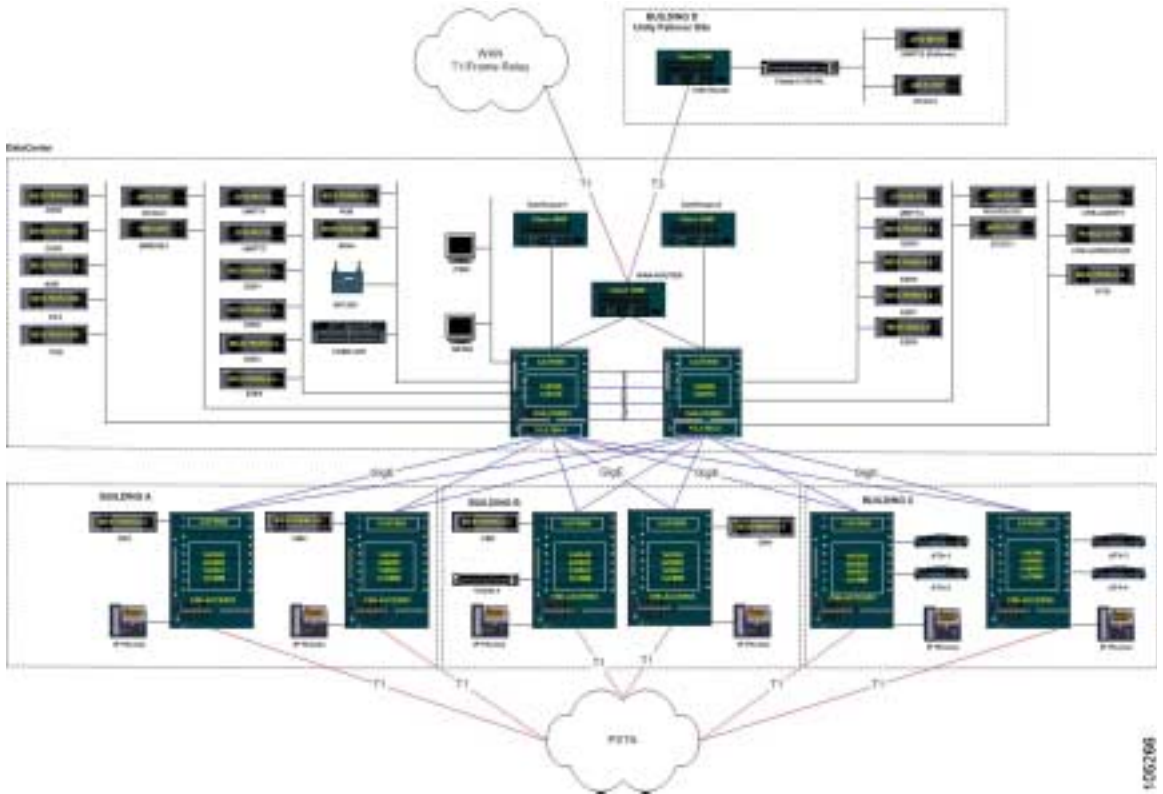


Table 1-2 lists the hardware and software components used in the Very Large Site model.

Table 1-2 Very Large Site Model Components

| Component | Description | Qty. |
|------------------------|--|------|
| ASR ¹ | Nuance 7.0.4 installed on an MCS-7825-1133 | 1 |
| Cisco ATA ² | Cisco ATA 186 and Cisco ATA188, 2.16 | 4 |

Table 1-2 Very Large Site Model Components (continued)

| Component | Description | Qty. |
|---|--|------|
| Cisco CallManager Cluster | Cisco CallManager 3.3(3) SR4a ³ installed on an MCS-7845H-2.4-EVV1, Cisco CallManager OS 2000-2-5sr4 | 6 |
| Cisco Customer Response Applications (Cisco CRA) | Cisco CRA 3.1(2) SR2, IP ICD ⁴ , and IP IVR ⁵ installed on an MCS-7845H-2.4-CC1; Dedicated MCS-7825-1133 set up as an ICD Call Statistics, Recording, and Monitoring Server | 1 |
| Cisco Emergency Responder | Cisco Emergency Responder 1.2(1) installed on an MCS-7835-1266 | 2 |
| Cisco Emergency Responder CAMA ⁶ Gateway | CS3745 12.2(15)ZJ3 with CAMA (H.323) (NM-HD-1V and VIC2-2FXO) | 1 |
| Cisco IP Phone | Cisco IP Phone CP-7902G, firmware CP7902010202SCCP031217B Cisco IP Phone CP-7905G, firmware CP7905010202SCCP031217B Cisco IP Phone CP-7910, firmware CP00405000400 Cisco IP Phone CP7912G, firmware CP7912010202SCCP031217B Cisco IP Phone CP-7920, firmware 7920.3.3-01-05 Cisco IP Phone CP-7935, firmware P00503010400 Cisco IP Phone CP-7940, firmware P00305000400 Cisco IP Phone CP-7960, firmware P00305000400 | 50 |
| Cisco Personal Assistant | Cisco Personal Assistant 1.4(2) installed on an MCS-7835-1266 | 2 |

Table 1-2 Very Large Site Model Components (continued)

| Component | Description | Qty. |
|-----------------------------------|--|------|
| Cisco Unity Bridge Server | Cisco Unity Bridge 3.0(1) installed on an IBM x205 | 1 |
| Cisco Unity Bridge Server Card | Brooktrout T1 card | 1 |
| Cisco Unity Unified Messaging | Cisco Unity 4.0(3) installed on a Compaq ML570 with Quad Processor | 4 |
| Distribution Switch | Cat6506 8.1(1) with Supervisor II | 2 |
| Domain Controller/ Global Catalog | Installed on an MCS-7847 | 3 |
| Exchange2000 | Installed on an MCS-7845H-2.4-EVV1 | 8 |
| FXS Gateway | VG248 1.2(1) | 1 |
| | Cisco Catalyst 6624 A00204000006 | 6 |
| Gatekeeper ⁷ | CS3660 12.2(15)T9 | 2 |
| Gateway for Cisco Unity Bridge | Cisco Catalyst 6624 A00204000006 and Cisco Catalyst 6608 D00404000007 | 1 |
| ITEM Network Management | ITEM Network Management 2.0 and ITM IDU 1.0 installed on a Pentium IV with 1.7 GHz CPU, 2 GB memory, 60 GB hard drive, and 4 GB swap space | 1 |
| Music on Hold (MOH) | MOH 3.3(3) SR3 installed on an MCS-7835-1266 | 1 |
| NetIQ Vivinet Manager | NetIQ Vivinet Manager 2.1 installed on a Pentium IV PC | 1 |
| Softphone | Cisco Softphone 1.3(3) installed on a Pentium IV PC | 1 |
| Switch | Cat6509 8.1.(1) with Supervisor II | 6 |

Table 1-2 *Very Large Site Model Components (continued)*

| Component | Description | Qty. |
|-------------------------|---|------|
| T1 Gateway | Cisco Catalyst Communication Media Module (CMM) 12.2(13)ZP1 | 6 |
| | Note Cisco recommends that you install Cisco CMM 12.2(13)ZP3 | |
| | Cisco Catalyst 6608 D00404000007 | 24 |
| WAN Router ⁷ | 7206 NPE400 12.2(15)T9 | 1 |
| Wireless Access Point | Cisco Aironet 1200 12.2(13)JA1 | 1 |

1. ASR = Automatic Speech Recognition
2. ATA = Analog Telephone Adaptor
3. Cisco CallManager 3.3(3) SR4 rebuilt due to CSCed45596
4. IP ICD = IP Integrated Contact Distribution
5. IP IVR = IP Interactive Voice Response
6. CAMA = Centralized Automatic Message Accounting
7. Not used in a Single Site scenario. Used only if this model is part of a Multi-Site Distributed scenario.

Large Site Model

The Large Site model can stand alone as a Single Site scenario or, with the addition of a WAN router and a gatekeeper, it can be one of the remote sites in the Multi-Site Distributed scenario. This model contains approximately 3,000 phones and approximately 75 agents.

[Figure 1-5](#) shows the topology of the Large Site model.

Figure 1-5 Large Site Model Topology

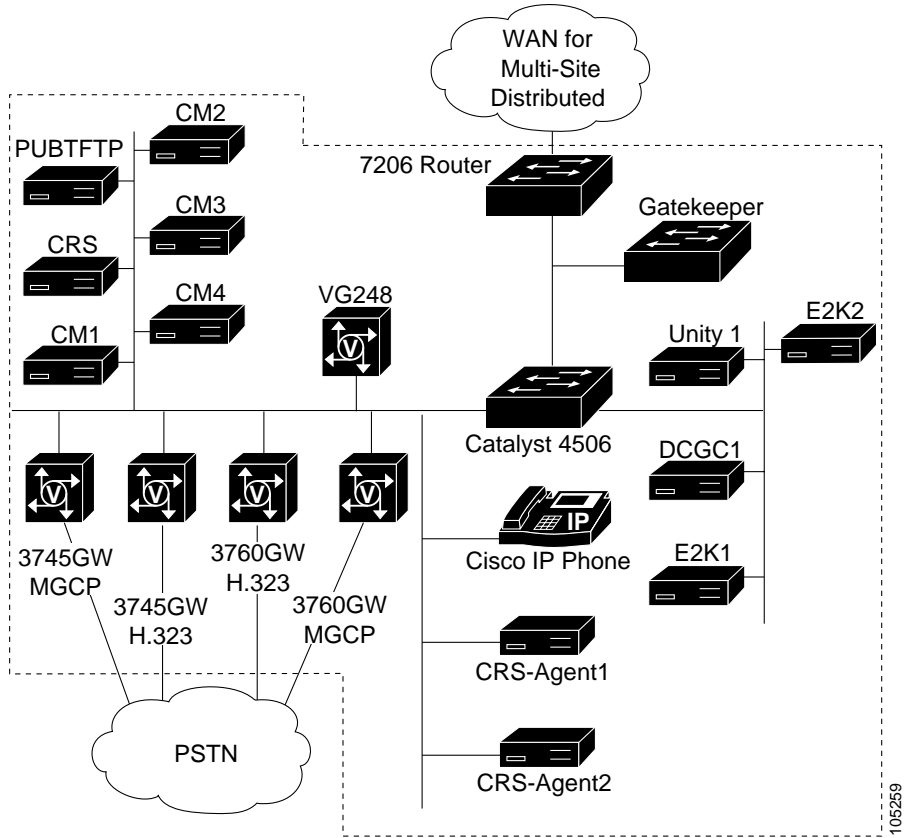


Table 1-3 lists the hardware and software components used in the Large Site model.

Table 1-3 Large Site Model Components

| Component | Description | Qty. |
|--|--|------|
| Cisco CallManager Cluster | Cisco CallManager 3.3(3) SR4a ¹ installed on an MCS-7835-1266, Cisco CallManager OS 2000-2-5sr4 | 5 |
| Cisco Customer Response Applications (Cisco CRA) | Cisco CRA 3.1(2) SR2, IP ICD ² , and IP IVR ³ installed on an MCS-7835-2.4-CC1 | 1 |
| Cisco IP Phone | Cisco IP Phone CP-7960, firmware P00305000400 | 4 |
| Cisco Unity Unified Messaging | Cisco Unity 4.0(3) installed on an MCS-7847 | 1 |
| Domain Controller/ Global Catalog | Installed on an MCS-7825-1133 | 1 |
| Exchange2000 | Installed on an MCS-7835-1266 | 2 |
| FXS Gateway | VG248 1.2(1) | 1 |
| Gatekeeper ⁴ | CS3660 12.2(15)T9 | 1 |
| Switch | Cat4506 12.1(19)EW1 with Supervisor III | 1 |
| T1 Gateway | WS-X4604-GWY 12.2(15)T9 (MGCP) | 1 |
| | Cisco 3745 12.2(15)T9 (H.323) (NM-HDV with VWIC-2MFT-T1) | 1 |
| | Cisco 3745 12.2(15)T9 (MGCP) (NM-HDV with VWIC-2MFT-T1) | 1 |
| | Cisco 3660 12.2(15)T9 (H.323) (NM-HDV with VWIC-2MFT-T1) | 1 |
| | Cisco 3660 12.2(15)T9 (MGCP) (NM-HDV with VWIC-2MFT-T1) | 1 |
| WAN Router ⁴ | 7206 NPE400 12.2(15)T9 | 1 |

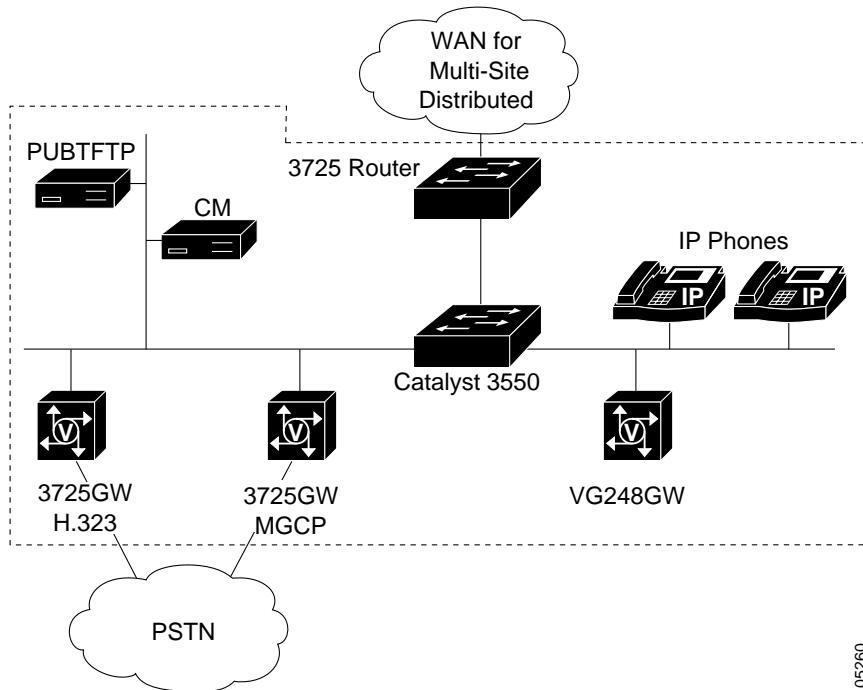
1. Cisco CallManager 3.3(3) SR4 rebuilt due to CSCed45596
2. IP ICD = IP Integrated Contact Distribution
3. IP IVR = IP Interactive Voice Response
4. Not used in a Single Site scenario. Used only if this model is part of a Multi-Site Distributed scenario.

Medium Site Model

The Medium Site model can stand alone as a Single Site scenario or, with the addition of a WAN router, it can be one of the remote sites in the Multi-Site Distributed scenario. This model contains approximately 1,000 phones.

Figure 1-6 shows the topology of the Medium Site model.

Figure 1-6 Medium Site Model Topology



105260

Table 1-4 lists the hardware and software components used in the Medium Site model.

Table 1-4 Medium Site Model Components

| Component | Description | Qty. |
|---------------------------|--|------|
| Cisco CallManager Cluster | Cisco CallManager 3.3(3) SR4a ¹ installed on an MCS-7825-1133, Cisco CallManager OS 2000-2-5sr4 | 2 |
| Cisco IP Phone | Cisco IP Phone CP-7960, firmware P00305000400 | 4 |
| FXO Gateway | Cisco 3725 12.2(15)ZJ3 (H.323) (NM-HD-2V with VIC2-2FXO) | 1 |
| | Cisco 3725 12.2(15)ZJ3 (MGCP) (NM-HD-2V with VIC2-2FXO) | 1 |
| FXS Gateway | VG248 1.2(1) | 1 |
| Switch | Cisco Catalyst 3550 12.1(13)EA1a | 1 |
| T1 Gateway | Cisco 3725 12.2(15)T9 (H.323) (NM-HDV with VWIC-2MFT-T1) | 1 |
| | Cisco 3725 12.2(15)T9 (MGCP) (NM-HDV with VWIC-2MFT-T1) | 1 |
| WAN Router ² | Cisco 3725 12.2(15)T9 | 1 |

1. Cisco CallManager 3.3(3) SR4 rebuilt due to CSCed45596
2. Not used in a Single Site scenario. Used only if this model is part of a Multi-Site Distributed scenario.

Small Site Model

The Small Site model can stand alone as a Single Site scenario or, with the addition of a WAN router, it can be one of the remote sites in the Multi-Site Distributed scenario. This model contains approximately 500 phones.

[Figure 1-7](#) shows the topology of the Small Site model.

Figure 1-7 Small Site Model Topology

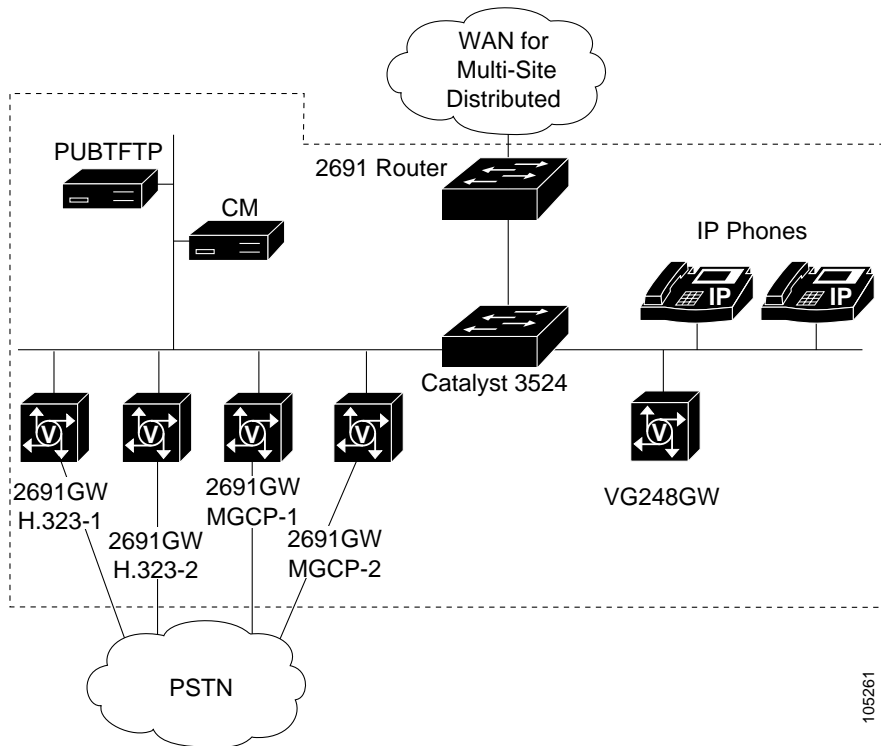


Table 1-5 lists the hardware and software components used in the Small Site model.

Table 1-5 Small Site Model Components

| Component | Description | Qty. |
|---------------------------|--|------|
| Cisco CallManager Cluster | Cisco CallManager 3.3(3) SR4a ¹ installed on a Cisco MCS-7815, Cisco CallManager OS 2000-2-5sr4 | 2 |
| IP Phone | Cisco IP Phone CP-7960, firmware P00305000400 | 4 |

Table 1-5 Small Site Model Components (continued)

| Component | Description | Qty. |
|-------------------------|---|------|
| FXO Gateway | Cisco 2691 12.2(15)ZJ3 (H.323) (NM-HD-1V with VIC2-2FXS) | 1 |
| | Cisco 2691 12.2(15)ZJ3 (MGCP) (NM-HD-1V with VIC2-2FXS) | 1 |
| FXS Gateway | VG248 1.2(1) | 1 |
| Switch | Catalyst 3524 12.0(5)WC5 | 1 |
| T1 Gateway | Cisco 2691 12.2(15)T9 (H.323) (NM-HDV with VWIC-2MFT-T1) | 1 |
| | Cisco 2691 12.2(15)T9 (MGCP) (NM-HDV with VWIC-2MFT-T1) | 1 |
| WAN Router ² | Cisco 2691 12.2(15)T9 | 1 |

1. Cisco CallManager 3.3(3) SR4 rebuilt due to CSCed45596

2. Not used in a Single Site scenario. Used only if this model is part of a Multi-Site Distributed scenario.

Central Site Model

In the Multi-Site Centralized scenario, the Central Site model is the site where the Cisco CallManager or the Cisco CallManager cluster is located. The Central Site model provides the call processing services for the remote sites.

[Figure 1-8](#) shows the topology of the Central Site model. This figure also includes topologies of typical Remote Site models.

Figure 1-8 Central Site and Remote Sites Topologies

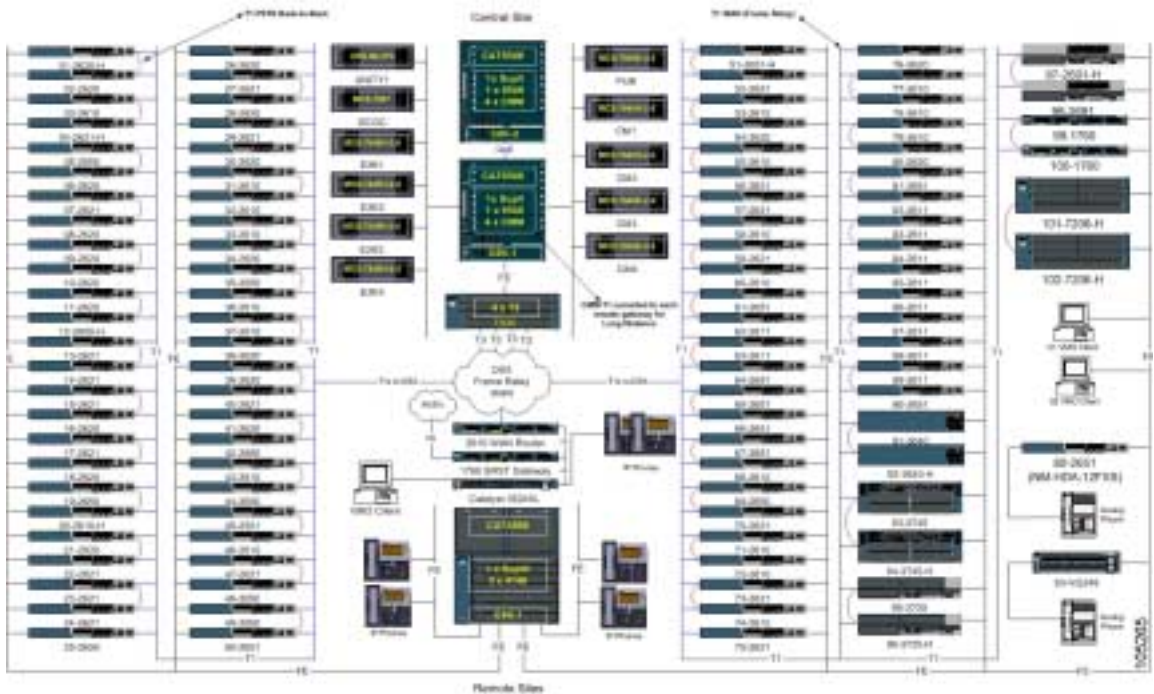


Table 1-6 lists the hardware and software components used in the Central Site model.

Table 1-6 Central Site Model Components

| Component | Description | Qty. |
|-----------------------------------|---|------|
| Cisco CallManager | Cisco CallManager 3.3(3) SR4a ¹ installed on an MCS-7845H-2.4-EVV1, Cisco CallManager OS 2000-2-5sr4 | 5 |
| Cisco Unity Unified Messaging | Cisco Unity 4.0(3) installed on a Compaq ML570 with Quad Processor | 1 |
| Domain Controller/ Global Catalog | Installed on an MCS-7825-1133 | 1 |
| Exchange2000 | Installed on an MCS-7845H-2.4-EVV1 | 2 |

Table 1-6 Central Site Model Components (continued)

| Component | Description | Qty. |
|------------|--|------|
| Switch | Cisco Catalyst 6506 8.1(1) with Supervisor II | 2 |
| T1 Gateway | Cisco Catalyst Communication Media Module (CMM) 12.2(13)ZP1 Note Cisco recommends that you install Cisco CMM 12.2(13)ZP3 | 8 |
| WAN Router | 7206 NPE400 12.2(15)T9 | 1 |

1. Cisco CallManager 3.3(3) SR4 rebuilt due to CSCed45596

Remote Site Models

In the Multi-Site Centralized scenario, the Remote Site models are sites other than the central site. (The Cisco CallManager cluster is located at the central site.)

There are two versions of the Remote Site model:

- Remote Site A—Router and gateway are on separate platforms
- Remote Site B—Router and gateway are on the same platform

[Figure 1-8](#) shows topologies of typical Remote Site models. This figure also includes the topology of the Central Site model.

[Table 1-7](#) lists the hardware and software components used in the Remote Site A model.

[Table 1-8](#) lists the hardware and software components that can be used in the Remote Site B model.

Table 1-7 Remote Site A Model Components

| Component | Description | Qty. |
|----------------|---|------|
| Cisco IP Phone | Cisco IP Phone CP-7960, firmware P00305000400 | 3 |
| FXS Gateway | VG248 1.2(1) | 1 |

Table 1-7 Remote Site A Model Components (continued)

| Component | Description | Qty. |
|-----------|---|------|
| Gateway | Cisco 1760 12.2(15)T9 (H.323) (VWIC-2MFT-T1) | 1 |
| Router | Cisco 2610 12.2(15)T9 | 1 |
| Switch | Catalyst 3524 12.0(5)WC5 | 1 |
| VMO | Installed on a Pentium IV PC | 1 |

**Note**

Not all of the routers and gateways shown in [Table 1-8](#) are used in a single Remote Site B model.

Table 1-8 Remote Site B Model Components

| Component | Description | Qty. |
|----------------|--|------|
| Cisco IP Phone | Cisco IP Phone CP-7902G, firmware CP7902010202SCCP031217B Cisco IP Phone CP-7905G, firmware CP7905010202SCCP031217B Cisco IP Phone CP-7910, firmware CP00405000400 Cisco IP Phone CP7912G, firmware CP7912010202SCCP031217B Cisco IP Phone CP-7920, firmware 7920.3.3-01-05 Cisco IP Phone CP-7935, firmware P00503010400 Cisco IP Phone CP-7940, firmware P00305000400 Cisco IP Phone CP-7960, firmware P00305000400 | 24 |
| Router | Cisco 7206 12.2(15)T9 | 1 |

Table 1-8 Remote Site B Model Components (continued)

| Component | Description | Qty. |
|--|--|------|
| Router/Gateway | 1760 12.2(15)T9 (MGCP) (VWIC-2MFT-T1) | 1 |
| | 1760 12.2(15)T9 (MGCP) (VIC-VG-2FXS) | 1 |
| | 2610XM 12.2(15)T9 (H.323) (NM-HDV with VWIC-2MFT-T1) | 1 |
| | 2610XM 12.2(15)T9 (MGCP) (NM-HDV with VWIC-2MFT-T1) | 19 |
| | 2611XM 12.2(15)T9 (H.323) (NM-HDV with VWIC-2MFT-T1) | 1 |
| | 2611XM 12.2(15)T9 (MGCP) (NM-HDV with VWIC-2MFT-T1) | 9 |
| | 2620XM 12.2(15)T9 (H.323) (NM-HDV with VWIC-2MFT-T1) | 1 |
| | 2620XM 12.2(15)T9 (MGCP) (NM-HDV with VWIC-2MFT-T1) | 19 |
| | 2621XM 12.2(15)T9 (H.323) (NM-HDV with VWIC-2MFT-T1) | 1 |
| | 2621XM 12.2(15)T9 (MGCP) (NM-HDV with VWIC-2MFT-T1) | 19 |
| | 2650XM 12.2(15)T9 (H.323) (NM-HDV with VWIC-2MFT-T1) | 1 |
| | 2650XM 12.2(15)T9 (MGCP) (NM-HDV with VWIC-2MFT-T1) | 9 |
| | 2651XM 12.2(15)T9 (H.323) (NM-HDV with VWIC-2MFT-T1) | 1 |
| | 2651XM 12.2(15)T9 (MGCP) (NM-HDA) | 1 |
| | 2651XM 12.2(15)T9 (MGCP) (NM-HDV with VWIC-2MFT-T1) | 8 |
| 2691 12.2(15)T9 (H.323) (NM-HDV with VWIC-2MFT-T1) | 1 | |

Table 1-8 Remote Site B Model Components (continued)

| Component | Description | Qty. |
|-------------------------------|--|------|
| Router/Gateway (continued) | 2691 12.2(15)T9 (MGCP) (NM-HDV with VWIC-2MFT-T1) | 1 |
| | 3640A 12.2(15)T9 (H.323) (NM-HDV with VWIC-2MFT-T1) | 1 |
| | 3640A 12.2(15)T9 (MGCP) (NM-HDV with VWIC-2MFT-T1) | 1 |
| | 3725 12.2(15)T9 (H.323) (NM-HDV with VWIC-2MFT-T1) | 1 |
| | 3725 12.2(15)T9 (MGCP) (NM-HDV with VWIC-2MFT-T1) | 1 |
| | 3745 12.2(15)T9 (H.323) (NM-HDV with VWIC-2MFT-T1) | 1 |
| | 3745 12.2(15)T9 (MGCP) (NM-HDA and NM-HDV with VWIC-2MFT-T1) | 1 |
| | 7206VXR 12.2(15)T9 (H.323) | 2 |
| Switch | Cisco Catalyst 4506 12.1(19)EW1 with Supervisor IV | 1 |



Cisco CallManager Configuration

This chapter provides an overview of how Cisco CallManager was set up for the Very Large Site model in IP Communications Systems Test Release 2.0 for IPT. This chapter does not include detailed installation and configuration instructions. Rather, it is intended to provide you with guidance as you set up the Cisco CallManager component of your IPT solution.

This chapter also does not include information about the Application menu in Cisco CallManager Administration. The web pages available from that menu use the default settings.

Cisco CallManager 3.3(3) SR4a was installed on multiple Cisco MCS-7845H-2.4-EVV1 servers and configured according to the instructions in the Cisco CallManager documentation. (Cisco CallManager 3.3(3) SR4 was rebuilt due to CSCed45596.) In general, default or recommended configuration values were used.

For detailed information about installing, configuring, and administering Cisco CallManager, refer to the Cisco CallManager documentation at this URL: http://www.cisco.com/univercd/cc/td/doc/product/voice/c_callmg/3_3/index.htm

This chapter includes the following topics:

- [Cisco CallManager System Configuration, page 2-2](#)
- [Cisco CallManager Route Plan Configuration, page 2-8](#)
- [Cisco CallManager Service Configuration, page 2-15](#)
- [Cisco CallManager Feature Configuration, page 2-22](#)
- [Cisco CallManager Device Configuration, page 2-27](#)
- [Cisco CallManager User Configuration, page 2-44](#)

Cisco CallManager System Configuration

The following sections provide an overview of how Cisco CallManager was configured on many of the System menu web pages that you access from Cisco CallManager Administration. These sections do not describe all of the System menu web pages or web page fields. Instead, they point out selected configuration information that will help you understand how Cisco CallManager was set up to perform most effectively.

- [System > Server Configuration, page 2-2](#)
- [System > Cisco CallManager Configuration, page 2-3](#)
- [System > Cisco CallManager Group, page 2-4](#)
- [System > Region, page 2-6](#)
- [System > Device Pool, page 2-6](#)

The following sections do not discuss these System menu options:

- Date/Time Group—Use default settings
- Device Defaults—Use default settings
- AAR Group—Applies only to Multi-Site Centralized scenario
- Enterprise Parameters—Use default setting
- Location—Applies only to Multi-Site Centralized scenario
- SRST—Applies only to Multi-Site Centralized scenario

System > Server Configuration

To access the Cisco CallManager Administration web pages for adding and configuring servers, choose **System > Server** from the Cisco CallManager Administration application.

The following Cisco CallManager servers were configured for the Very Large Site model:

- CM1
- CM2
- CM3

- CM4
- MOH
- Publisher
- TFTP

Table 2-1 describes the settings in the Server Configuration page.

Table 2-1 Cisco CallManager Server Configuration

| Field | Setting |
|----------------------|--|
| Host Name/IP Address | Name of the server For example, CM1 or Publisher |
| MAC Address | Blank |
| Description | Description of server For example, Cisco CallManager 1 Server or Publisher Server |

System > Cisco CallManager Configuration

To access the Cisco CallManager Administration web pages for adding and configuring Cisco CallManagers, choose **System > Cisco CallManager** from the Cisco CallManager Administration application.

The following Cisco CallManagers were configured for the Very Large Site model:

- CM1
- CM2
- CM3
- CM4
- MOH
- Publisher
- TFTP

Table 2-2 describes the settings in the Cisco CallManager Configuration page.

Table 2-2 Cisco CallManager Configuration

| Field | Setting |
|--|--|
| Cisco CallManager Name | Name of the Cisco CallManager For example, CM1 |
| Description | Description of the Cisco CallManager For example, Cisco CallManager 1 Server. |
| Starting Directory Number | 21000 |
| Ending Directory Number | 22000 |
| Partition | internal_p |
| External Phone Number Mask | 91939XXXXX |
| Auto-registration Disabled on this Cisco CallManager | Unchecked |
| Ethernet Phone Port | 2000 |
| Digital Port | 2001 |
| Analog Port | 2002 |
| MGCP Listen Port | 2427 |
| MGCP Keep-alive Port | 2428 |

System > Cisco CallManager Group

To access the Cisco CallManager Administration web pages for adding and configuring Cisco CallManager Groups, choose **System > Cisco CallManager Group** from the Cisco CallManager Administration application.

The following Cisco CallManager groups were configured for the Very Large Site model. The four Standalone groups are for use in the Multi-Site Distributed scenario.

- CM1–CM2
- CM2–CM1
- CM3–CM4
- CM4–CM3
- Default
- Standalone–CM1
- Standalone–CM2
- Standalone–CM3
- Standalone–CM4

[Table 2-3](#) describes the settings in the Cisco CallManager Group Configuration page.

Table 2-3 Cisco CallManager Group Configuration

| Field | Setting |
|--|--|
| Cisco CallManager Group | Name of the Cisco CallManager group |
| Auto-registration Cisco CallManager Group | Checked for group CM1-CM2 Unchecked for all other groups |
| Selected Cisco CallManagers (ordered by highest priority) | For group CM1–CM2: CM1, CM2 For group CM2–CM1: CM2, CM1 For group CM3–CM4: CM3, CM4 For group CM4–CM3: CM4, CM3 For group Standalone–CM1: CM1 For group Standalone–CM2: CM2 For group Standalone–CM3: CM3 For group Standalone–CM4: CM4 |

System > Region

To access the Cisco CallManager Administration web pages for adding and configuring regions, choose **System > Region** from the Cisco CallManager Administration application.

The following regions were configured for the Very Large Site model:

- Default
- Transcoder Region

[Table 2-4](#) describes the settings in the Region Configuration page.

Table 2-4 Region Configuration

| Field | Setting |
|------------------------------|--|
| Region Name | Name of the region |
| Default (Within this Region) | g711 |
| Transcoder Region | For Default: g711 For Transcoder Region: g729 |

System > Device Pool

To access the Cisco CallManager Administration web pages for adding and configuring device pools, choose **System > Device Pool** from the Cisco CallManager Administration application.

The following device pools were configured for the Very Large Site model:

- Default
- HQ-CM1-CM2
- HQ-CM2-CM1
- HQ-CM3-CM4
- HQ-CM4-CM3
- Standalone-CM1
- Standalone-CM2

- Standalone–CM3
- Standalone–CM4

Table 2-5 describes the settings in the Device Pool Configuration page.

Table 2-5 Device Pool Configuration

| Field | Setting |
|--|--|
| Device Pool Name | Name of the device pool |
| Cisco CallManager Group | For HQ–CM1–CM2: CM1-CM2 For HQ–CM2–CM1: CM2-CM1 For HQ–CM3–CM4: CM3-CM4 For HQ–CM4–CM3: CM4-CM3 For Standalone–CM1: Standalone-CM1 For Standalone–CM2: Standalone-CM2 For Standalone–CM3: Standalone-CM3 For Standalone–CM4: Standalone-CM4 |
| Date/Time Group | CMLocal |
| Region | For HQ– device pools: Default For Standalone– device pools: Transcoder Region |
| Softkey Template | Standard User |
| SRST Reference | Disable |
| Calling Search Space for Auto-registration | For HQ– device pools: internal_css For Standalone– device pools: <None> |
| Media Resource Group List | MRGL_1 |
| Network Hold MOH Audio Source | Network_Hold_MOH |
| User Hold MOH Audio Source | SampleAudioSource |
| Network Locale | United States |
| User Locale | English United States |

Cisco CallManager Route Plan Configuration

The following sections provide an overview of how Cisco CallManager was configured on many of the Route Plan menu web pages that you access from Cisco CallManager Administration. These sections do not describe all of the Route Plan menu web pages or web page fields. Instead, they point out selected configuration information that will help you understand how Cisco CallManager was set up to perform most effectively.

- [Route Plan > Partition, page 2-8](#)
- [Route Plan > Calling Search Space, page 2-9](#)
- [Route Plan > Route Group, page 2-10](#)
- [Route Plan > Route List, page 2-11](#)
- [Route Plan > Route Pattern, page 2-12](#)
- [Route Plan > Translation Pattern, page 2-13](#)

The following sections do not discuss these Route Plan menu options:

- Application Dial Rules—Use default settings
- Route Filter—Not configured

Route Plan > Partition

To access the Cisco CallManager Administration web pages for adding and configuring partitions, choose **Route Plan > Partition** from the Cisco CallManager Administration application.

[Table 2-6](#) describes the partitions that were configured for the Very Large Site model.

Table 2-6 Partitions

| Partition Name | Description |
|----------------|---|
| E911_p | Partition for CER911 CTI Route Point |
| E911_to_PSAP_p | Partition for E911 PSAP |
| Internal_p | Partition for phones with internal calling privileges |

Table 2-6 *Partitions (continued)*

| Partition Name | Description |
|---------------------|--|
| National_p | Partition for phones with national calling privileges |
| International_p | Partition for phones with international calling privileges |
| PA_p | Partition for PA CTI Route Point |
| PAManagedEmployee_p | Partition for PA Interceptor Ports |
| Unity_p | Partition for Cisco Unity Unified Messaging |

Route Plan > Calling Search Space

To access the Cisco CallManager Administration web pages for adding and configuring calling search spaces, choose **Route Plan > Calling Search Space** from the Cisco CallManager Administration application.

[Table 2-7](#) describes the calling search spaces that were configured for the Very Large Site model.

Table 2-7 *Calling Search Spaces*

| Calling Search Space Name | Description | Selected Partitions |
|---------------------------|---|------------------------|
| E911_CSS | Calling Search Space for E911 | E911_p, E911_to_PSAP_p |
| E911_to PSAP_CSS | Calling Search Space for E911 to PSAP | E911_to_PSAP_p |
| Internal_CSS | Calling Search Space for internal calling privileges | internal_p |
| National_CSS | Calling Search Space for internal, national, PA, and Unity calling privileges | national_p |

Table 2-7 Calling Search Spaces (continued)

| Calling Search Space Name | Description | Selected Partitions |
|---------------------------|---|--|
| International_CSS | Calling Search Space for internal, national, international PA, and Unity calling privileges | internal_p, national_p, international_p, PA_p, and Unity_p |
| PA_CSS | Calling Search Space for PA | PAManagedEmployee_p, national_p |
| Unity_CSS | Calling Search Space for Unity | internal_p, PAManagedEmployee_p, unity_p |

Route Plan > Route Group

To access the Cisco CallManager Administration web pages for adding and configuring route groups, choose **Route Plan > Route Group** from the Cisco CallManager Administration application.

[Table 2-8](#) shows four of the route groups that were configured for the Very Large Site model. Approximately 100 other route groups were configured but are not shown in this table.

Table 2-8 Route Groups

| Route Group Name | Route Group Members |
|-------------------------------|--|
| E911_Call_to_PSAP_RG | Device=S0/DS1-0@SDA22222222201, Port=All, Order=1 Device=S0/DS1-0@SDA22222222202, Port=All, Order=2 |
| access_1_port_4_4_dms_trunk56 | Device=S0/DS1-0@SDA0002FCE1A455, Port=All, Order=1 |

Table 2-8 Route Groups (continued)

| Route Group Name | Route Group Members |
|------------------------------|--|
| access_1_port_9_1_Nortel_pbx | Device= S1/DS1-1@ACCESS1-CMM1.cisco.com CMM1.cisco.com, Port=All, Order=1 |
| GK_ICT_RG ¹ | Device=ict_to_cm1, Port=All, Order=1 Device=ict_to_cm2, Port=All, Order=2 Device=ict_to_cm3, Port=All, Order=3 Device=ict_to_cm4, Port=All, Order=4 |

1. Required only for Multi-Site Distributed scenario.

Route Plan > Route List

To access the Cisco CallManager Administration web pages for adding and configuring route lists, choose **Route Plan > Route List** from the Cisco CallManager Administration application.

Table 2-9 describes four of the route lists that were configured for the Very Large Site model. Approximately 43 other route lists were configured but are not shown in this table.

Table 2-9 Route Lists

| Route List Name | Description | Selected Route Groups |
|---------------------|-----------------------------------|-------------------------------|
| E911call_to_PSAP_RL | Route List for E911 calls to PSAP | E911_Call_to_PSAP_RG |
| DMS_trunk56 | Route List for DMS100 Trunk 56 | Access_1_port_4_4_dms_trunk56 |

Table 2-9 Route Lists (continued)

| Route List Name | Description | Selected Route Groups |
|-----------------|-------------------------------|----------------------------------|
| Nortel_pbx | Route List for Nortel PBX | Access_1_port_9_1_ Nortel_pbx |
| GK_ICT_RL | Route List for Gatekeeper ICT | GK_ICT_RG |

Route Plan > Route Pattern

To access the Cisco CallManager Administration web pages for adding and configuring route patterns, choose **Route Plan > Route Pattern** from the Cisco CallManager Administration application.

Forty-three route patterns were configured for the Very Large Site model. This section describes the following route patterns:

- 10.911
- 9.@
- 9.405x
- 8.xxxxxxx

[Table 2-10](#) describes the settings in the Route Pattern Configuration page for these selected route patterns.

Table 2-10 Route Pattern Configuration

| Field | 10.911 Route Pattern Settings | 9.@ Route Pattern Settings | 9.405x Route Pattern Settings | 8.xxxxxxx Route Pattern Settings |
|----------------|-------------------------------|-------------------------------|-------------------------------|---|
| Route Pattern | 10.911 | 9.@ | 9.405x | 8.xxxxxxx |
| Partition | E911_p | international_p | national_p | internal_p |
| Description | Route Pattern for E911 | Route Pattern to DMS Trunk56 | Route Pattern to Nortel PBX | Route Pattern for GK controlled ICT calls |
| Numbering Plan | North American Numbering Plan | North American Numbering Plan | North American Numbering Plan | North American Numbering Plan |
| Route Filter | <None> | <None> | <None> | <None> |

Table 2-10 Route Pattern Configuration (continued)

| Field | 10.911 Route Pattern Settings | 9.@ Route Pattern Settings | 9.405x Route Pattern Settings | 8.xxxxxxx Route Pattern Settings |
|---|-------------------------------|----------------------------|-------------------------------|----------------------------------|
| Gateway/Route List | E911_call_to_PS AP_RL | DMS_trunk56 | Nortel_pbx_RL | GK_ICT_RL |
| Route Option | Route This Pattern | Route This Pattern | Route This Pattern | Route This Pattern |
| Provide Outside Dial Tone | Checked | Checked | Checked | Checked |
| Use Calling Party's External Phone Number Mask | Checked | Unchecked | Unchecked | Checked |
| Calling Party Transform Mask | 6013929911 | 91939xxxxx | blank | 919392xxxx |
| Prefix Digits (Outgoing Calls) | blank | blank | blank | blank |
| Calling Party Presentation | Default | Default | Default | Default |
| Discard Digits | PreDot | PreAt | PreDot | PreDot |
| Called Party Transform Mask | 9194725016 | blank | blank | 601xxxxxxx |
| Prefix Digits (Outgoing Calls) | blank | blank | blank | blank |
| ISDN Network-Specific Facilities Information Element Fields | Not configured | Not configured | Not configured | Not configured |

Route Plan > Translation Pattern

To access the Cisco CallManager Administration web pages for adding and configuring translation patterns, choose **Route Plan > Translation Pattern** from the Cisco CallManager Administration application.

Table 2-11 describes the settings in the Translation Pattern Configuration page for two of the translation patterns that were configured for the Very Large Site model. Eleven other translation patterns were configured but are not shown in this table.

Table 2-11 Translation Pattern Configuration

| Field | 24xxx Translation Pattern Settings | 9.11 Translation Pattern Settings |
|--|--|-----------------------------------|
| Translation Pattern | 24xxx | 9.11 |
| Partition | National_p | Internal_p |
| Description | PA-Translation Pattern-24XXX Route Point | Translation Pattern for 911 calls |
| Numbering Plan | North American Numbering Plan | North American Numbering Plan |
| Route Filter | <None> | <None> |
| Calling Search Space | PA_CSS | E911_CSS |
| Route Option | Route This Pattern | Route This Pattern |
| Provide Outside Dial Tone | Checked | Checked |
| Use Calling Party's External Phone Number Mask | Checked | Unchecked |
| Calling Party Transform Mask | 919392xxxx | blank |
| Prefix Digits (Outgoing Calls) | blank | blank |
| Calling Party Presentation | Default | Default |
| Discard Digits | PreDot | PreDot |
| Called Party Transform Mask | 601xxxxxxx | 911 |
| Prefix Digits (Outgoing Calls) | blank | blank |

Cisco CallManager Service Configuration

The following sections provide an overview of how Cisco CallManager was configured on many of the Service menu web pages that you access from Cisco CallManager Administration. These sections do not describe all of the Service menu web pages or web page fields. Instead, they point out selected configuration information that will help you understand how Cisco CallManager was set up to perform most effectively.

- [Service > Media Resource > Conference Bridge, page 2-15](#)
- [Service > Media Resource > Media Termination Point, page 2-16](#)
- [Service > Media Resource > Music On Hold Audio Source, page 2-17](#)
- [Service > Media Resource > Music On Hold Server, page 2-17](#)
- [Service > Media Resource > Transcoder, page 2-18](#)
- [Service > Media Resource > Media Resource Group, page 2-19](#)
- [Service > Media Resource > Media Resource Group List, page 2-20](#)
- [Service > Service Parameters, page 2-21](#)

The following sections do not discuss these Service menu options:

- Cisco IPMA Configuration Wizard—Not configured
- Cisco CM Attendant Console—Not configured

Service > Media Resource > Conference Bridge

To access the Cisco CallManager Administration web pages for adding and configuring conference bridges, choose **Service > Media Resource > Conference Bridge** from the Cisco CallManager Administration application.

[Table 2-12](#) describes the settings in the Conference Bridge Configuration page for one software conference bridge and one hardware conference bridge that were configured for the Very Large Site model. Five other software conference bridges and 22 other hardware conference bridges were configured but are not shown in this table.

Table 2-12 Conference Bridge Configuration

| Field | Software Conference Bridge Settings | Hardware Conference Bridge Settings |
|--------------------------|-------------------------------------|-------------------------------------|
| Conference Bridge Type | Cisco Conference Bridge Software | Cisco Conference Bridge Hardware |
| Host Server | CM1 | — |
| MAC Address | — | 00027E38FF9 |
| Conference Bridge Name | CFB_CM1 | — |
| Description | SW Conference Bridge in CM1 | Catalyst 6608 Access 1 port 7/5 |
| Device Pool | HQ-CM1-CM2 | HQ-CM1-CM2 |
| Location | <None> | <None> |
| Special Load Information | — | blank |

Service > Media Resource > Media Termination Point

To access the Cisco CallManager Administration web pages for adding and configuring media termination points, choose **Service > Media Resource > Media Termination Point** from the Cisco CallManager Administration application.

[Table 2-13](#) describes the settings in the Media Termination Point Configuration page for one media termination point that was configured for the Very Large Site model. Four other media termination points were configured but are not shown in this table.

Table 2-13 Media Termination Point Configuration

| Field | Setting |
|------------------------------|---------|
| Host Server | CM1 |
| Media Termination Point Name | MTP_CM1 |

Table 2-13 Media Termination Point Configuration (continued)

| Field | Setting |
|-------------|---------------------|
| Description | Software MTP in CM1 |
| Device Pool | Default |

Service > Media Resource > Music On Hold Audio Source

To access the Cisco CallManager Administration web pages for adding and configuring music on hold (MOH) audio sources, choose **Service > Media Resource > Music On Hold Audio Source** from the Cisco CallManager Administration application.

Two MOH audio sources were configured for the Very Large Site model.

[Table 2-14](#) describes how the MOH audio sources were configured in the Music On Hold (MOH) Audio Source Configuration page.

Table 2-14 Music On Hold Audio Source Configuration

| Field | MOH Audio Source 1 Settings | MOH Audio Source 2 Settings |
|-----------------------|-----------------------------|-----------------------------|
| MOH Audio Source File | SampleAudioSource | SampleAudioSource |
| MOH Audio Source Name | SampleAudioSource | MOH_MOH |
| Play Continuously | Checked | Checked |
| Allow Multicasting | Checked | Checked |

Service > Media Resource > Music On Hold Server

To access the Cisco CallManager web pages for adding and configuring music on hold (MOH) servers, choose **Service > Media Resource > Music On Hold Server** from the Cisco CallManager Administration application.

[Table 2-15](#) describes the settings in the Music On Hold (MOH) Server Configuration page.

Table 2-15 Music On Hold Server Configuration

| Field | Setting |
|---|----------------------|
| Host Server | MOH |
| Music on Hold Server Name | MOH_MOH |
| Description | Music on Hold Server |
| Device Pool | HQ-CM1-CM2 |
| Location | <None> |
| Maximum Half Duplex Streams | 250 |
| Maximum Multicast Connections | 30 |
| Fixed Audio Source Device | blank |
| Run Flag | Yes |
| Enable Multicast Audio Sources on this MOH Server | Checked |
| Base Multicast IP Address | 239.192.240.1 |
| Base Multicast Port Number | 16420 |
| Increment Multicast on | Port Number |
| Sample Audio Source | 2 Max Hops |
| MOH_MOH | 2 Max Hops |

Service > Media Resource > Transcoder

To access the Cisco CallManager Administration web pages for adding and configuring transcoders, choose **Service > Media Resource > Transcoder** from the Cisco CallManager Administration application.

Two transcoder audio sources were configured for the Very Large Site model.

[Table 2-16](#) describes how the transcoders were configured in the Transcoder Configuration page.

Table 2-16 Transcoder Configuration

| Field | Transcoder 1 Settings | Transcoder 2 Settings |
|--------------------------|--|--|
| Transcoder Type | Cisco Media Termination Point Hardware | Cisco Media Termination Point Hardware |
| Description | Hardware MTP | Hardware MTP |
| MAC Address | 00027E38FF98 | 0002FCE1D030 |
| Device Pool | HQ-CM1-CM2 | HQ-CM3-CM4 |
| Special Load Information | blank | blank |

Service > Media Resource > Media Resource Group

To access the Cisco CallManager Administration web pages for adding and configuring media resource groups, choose **Service > Media Resource > Media Resource Group** from the Cisco CallManager Administration application.

The following media resource groups were configured for the Very Large Site model:

- MRG_HWCFB
- MRG_HWMTP
- MRG_MOH
- MRG_SWCFB
- MRG_SWMTP

[Table 2-17](#) describes the settings in the Media Resource Group Configuration page.

Table 2-17 Media Resource Group Configuration

| Field | MRG_HWCFB Settings | MRG_HWMTP Settings | MRG_MOH Settings | MRG_SWCFB Settings | MRG_SWMTP Settings |
|-----------------------------|---|---|------------------------------|---|---------------------------------------|
| Media Resource Group Name | MRG_HWCFB | MRG_HWMTP | MRG_MOH | MRG_SWCFB | MRG_SWMTP |
| Description | Media Resource Group for Hardware Conference Bridge | Media Resource Group for Hardware MTP/ Transcoder | Media Resource Group for MOH | Media Resource Group for Software Conference Bridge | Media Resource Group for Software MTP |
| Selected Media Resource | CFB00027E38 FF9A (CFB) ¹ | MTP00027E38 FF98 (XCODE) ¹ | MOH_MOH (MOH) [Multicast] | CFB_CM1 (CFB) ¹ | MTP_CM1 (MTP) |
| Use Multicast for MOH Audio | Not checked | Not checked | Checked | Not checked | Not checked |

1. Additional Selected Medial Resources were configured but are not shown in this example.

Service > Media Resource > Media Resource Group List

To access the Cisco CallManager Administration web pages for adding and configuring media resource group lists, choose **Service > Media Resource > Media Resource Group List** from the Cisco CallManager Administration application.

[Table 2-18](#) describes the settings in the Media Resource Group List Configuration page.

Table 2-18 Media Resource Group List Configuration

| Field | Setting |
|--------------------------------|---|
| Media Resource Group Name | MRGL_HQ |
| Selected Media Resource Groups | MRG_HWCFB MRG_HWMTP MRG_SWCFB MRG_MTP MRG_MOH |

Service > Service Parameters

To access the Cisco CallManager Administration web pages for adding and configuring services on selected servers, choose **Service > Service Parameters** from the Cisco CallManager Administration application.

[Table 2-19](#) describes the settings in the Music On Hold (MOH) Server Configuration page for the CM1, CM2, CM3, and CM4 servers.

Table 2-19 Server Parameter Configuration Settings for Each Server

| Service for CM1, CM2, CM3, and CM4 Servers | Settings |
|--|---|
| Cisco CallManager | All default settings except the following: <ul style="list-style-type: none"> • Call Diagnostics Enabled: True • T302 Timer: 4000 • Device Status Poll Interval: 60000 • T302 Timer: 4000 • Multiple Tenant MWI Modes: True • Voice mail Maximum Hop Count: 69 • Advanced CallForward Hop Flag: True • Maximum Ad-hoc Conference: 6 • Supplementary Services Initialization Timer (sec): 180 |
| Cisco CTIManager | default settings |
| Cisco Database Layer Monitor | default settings |
| Cisco Extended Functions | default settings |
| Cisco Extension Mobility Logout | All default settings except Call Diagnostics Enabled: True |
| Cisco IP Voice Media Streaming App | default settings |
| Cisco Messaging Interface | default settings |
| Cisco RIS Data Collector | default settings |
| Cisco Telephony Call Dispatcher | default settings |

Cisco CallManager Feature Configuration

The following sections provide an overview of how Cisco CallManager was configured on many of the Feature menu web pages that you access from Cisco CallManager Administration. These sections do not describe all of the

Feature menu web pages or web page fields. Instead, they point out selected configuration information that will help you understand how Cisco CallManager was set up to perform most effectively.

- [Feature > Call Park, page 2-23](#)
- [Feature > Cisco IP Phone Services, page 2-24](#)
- [Feature > Voice Mail > Cisco Voice Mail Port, page 2-24](#)
- [Feature > Voice Mail > Message Waiting, page 2-25](#)
- [Feature > Voice Mail > Voice Mail Pilot, page 2-26](#)
- [Feature > Voice Mail > Voice Mail Profile, page 2-27](#)

The following sections do not discuss these Feature menu options:

- Find and List Call Pickup Number—Not configured
- Find and List Meet-Me Numbers—Not configured

Feature > Call Park

To access the Cisco CallManager Administration web pages for adding and configuring call park numbers, choose **Feature > Call Park** from the Cisco CallManager Administration application.

[Table 2-20](#) describes the settings in the Call Park Configuration page.

Table 2-20 *Call Park Configuration*

| Field | Setting |
|------------------------|-------------------|
| Call Park Number/Range | 55551 |
| Description | Call park for CM1 |
| Partition | Internal_p |
| Call Manager | CM1 |

Feature > Cisco IP Phone Services

To access the Cisco CallManager Administration web pages for adding and configuring phone services, choose **Feature > Cisco IP Phone Services** from the Cisco CallManager Administration application.

[Table 2-21](#) describes the settings in the Cisco IP Phone Services Configuration page.

Table 2-21 Cisco IP Phone Services Configuration

| Field | Setting |
|---------------------|---|
| Service Name | Login Extension Mobility |
| Service Description | For Extension Mobility |
| Service URL | http://1.1.1.1/emapp/EMAppServlet?device=#DEVICENAME# |
| Parameters | blank |
| Character Set | Western European (Latin1) |

Feature > Voice Mail > Cisco Voice Mail Port

To access the Cisco CallManager Administration web pages for adding and configuring Cisco voice mail ports, choose **Feature > Voice Mail > Cisco Voice Mail Port** from the Cisco CallManager Administration application.

[Table 2-22](#) describes the settings in the Cisco Voice Mail Port Configuration page for one Cisco voice mail port that was configured for the Very Large Site model. Three hundred and thirty-five other Cisco voice mail ports were configured but are not shown in this table.

Table 2-22 Cisco Voice Mail Port Configuration

| Field | Setting |
|-------------|------------------|
| Port name | CiscoUM1-VI1 |
| Description | UNITY1 Voicemail |
| Device Pool | HQ-CM1-CM2 |

Table 2-22 Cisco Voice Mail Port Configuration (continued)

| Field | Setting |
|------------------------------|---|
| Calling Search Space | unity_css |
| Location | <None> |
| Directory Number | 22100 |
| Partition | unity_p |
| Calling Search Space | unity_css |
| AAR Group | <None> |
| Display (Internal Caller ID) | Unity1Voicemail |
| External Number mask | blank |
| Forward All | Destination: blank Calling Search Space: <None> |
| Forward Busy | Destination: 22101 Calling Search Space: unity_css |
| Forward No Answer | Destination: 22200 Calling Search Space: unity_css |

Feature > Voice Mail > Message Waiting

To access the Cisco CallManager Administration web pages for adding and configuring message waiting number, choose **Feature > Voice Mail > Message Waiting** from the Cisco CallManager Administration application.

[Table 2-23](#) describes the settings in the Message Waiting Configuration page for two of the message waiting numbers that were configured for the Very Large Site model. Eight other message waiting numbers were configured but are not shown in this table.

Table 2-23 Message Waiting Configuration

| Field | Message Waiting Number 1 Settings | Message Waiting Number 2 Settings |
|---------------------------|-----------------------------------|-----------------------------------|
| Message Waiting Number | 22198 | 22199 |
| Description | MWI number to turn the light on | MWI number to turn the light off |
| Message Waiting Indicator | On | Off |
| Partition | unity_p | unity_p |
| Calling Search Space | unity_css | unity_css |

Feature > Voice Mail > Voice Mail Pilot

To access the Cisco CallManager Administration web pages for adding and configuring voice mail pilots, choose **Feature > Voice Mail > Voice Mail Pilot** from the Cisco CallManager Administration application.

[Table 2-24](#) describes the settings in the Voice Mail Pilot Configuration page for one of the voice mail pilots that was configured for the Very Large Site model. Four other Cisco voice mail pilots were configured but are not shown in this table.

Table 2-24 Voice Mail Pilot Configuration

| Field | Setting |
|---|---------------------|
| Voice Mail Pilot Number | 22100 |
| Description | Unity1 Pilot Number |
| Calling Search Space | unity_css |
| Make this the default Voice Mail Pilot for the system | Checked |

Feature > Voice Mail > Voice Mail Profile

To access the Cisco CallManager Administration web pages for adding and configuring voice mail profiles, choose **Feature > Voice Mail > Cisco Voice Mail Profile** from the Cisco CallManager Administration application.

[Table 2-25](#) describes the settings in the Voice Mail Profile Configuration page for one of the voice mail profiles that was configured for the Very Large Site model. Seven other Cisco voice mail profiles were configured but are not shown in this table.

Table 2-25 Voice Mail Profile Configuration

| Field | Setting |
|---|-------------------------------|
| Voice Mail Profile Name | Unity1 |
| Description | Voice Mail Profile for Unity1 |
| Voice mail Pilot | 22100/unity_css |
| Voice Mail Box Mask | blank |
| Make this the default voice mail profile for the system | Unchecked |

Cisco CallManager Device Configuration

The following sections provide an overview of how Cisco CallManager was configured on many of the Device menu web pages that you access from Cisco CallManager Administration. These sections do not describe all of the Device menu web pages or web page fields. Instead, they point out selected configuration information that will help you understand how Cisco CallManager was set up to perform most effectively.

- [Device > CTI Route Point, page 2-28](#)
- [Device > Gatekeeper, page 2-30](#)
- [Device > Gateway, page 2-30](#)
- [Device > Phone, page 2-35](#)
- [Device > Trunk, page 2-39](#)

- [Device > Device Settings > Device Profile](#), page 2-42

The following sections do not discuss these Device menu options:

- Device Settings > Firmware Load Information—Use default settings
- Device Settings > Phone Button Template—Use default settings
- Device Settings > Softkey Template—Use default settings

Device > CTI Route Point

To access the Cisco CallManager Administration web pages for adding and configuring CTI route points, choose **Device > CTI Route Point** from the Cisco CallManager Administration application.

[Table 2-26](#) describes the settings on the CTI Route Point Configuration page for three CTI route points that were configured for the Very Large Site model.

[Table 2-27](#) shows how one of the directory numbers was configured for each example route point.

Fifteen other CTI route points were configured, including route points for Cisco CRA, Cisco Personal Assistant, and Cisco Emergency Responder. These route points are not shown in the following tables.

Table 2-26 CTI Route Point Configuration

| Field | CTI Route Point 1 Setting | CTI Route Point 2 Setting | CTI Route Point 3 Setting |
|----------------------|---------------------------|---------------------------|---------------------------|
| Device Name | AA | PA24XXX | PAMainNumber |
| Description | x23110 Auto Attendant | PA24XXX | PAMainNumber |
| Device Pool | HQ-CM1-CM2 | HQ-CM1-CM2 | HQ-CM1-CM2 |
| Calling Search Space | national_css | PA_CSS | PA_CSS |
| Location | <None> | <None> | <None> |

Table 2-27 Directory Number Configuration for CTI Route Points

| Field | CTI Route Point 1 Setting | CTI Route Point 2 Setting | CTI Route Point 3 Setting |
|------------------------------|------------------------------|------------------------------|---|
| Directory Number | 23110 | 24XXX | 24000 |
| Partition | internal_p | PA | national_p |
| Voice Mail Profile | <None> | <None> | <None> |
| Calling Search Space | national_css | PA_CSS | PA_CSS |
| AAR Group | <None> | <None> | <None> |
| Call Waiting | Not available on this device | Not available on this device | Not available on this device |
| Auto Answer | Not available on this device | Not available on this device | Not available on this device |
| Forward All | default settings | default settings | default settings |
| Forward Busy | default settings | default settings | default settings, except Calling Search Space: PA_CSS |
| Forward No Answer | default settings | default settings | default settings, except Calling Search Space: PA_CSS |
| Forward On Failure | default settings | default settings | default settings |
| Call Pickup Group | <None> | <None> | <None> |
| Display (Internal Caller ID) | blank | blank | blank |
| External Phone Number Mask | blank | blank | blank |
| Line Text Label | Not available on this device | Not available on this device | Not available on this device |
| Message Waiting Lamp Policy | Not available on this device | Not available on this device | Not available on this device |
| Ring Setting (Phone Idle) | Not available on this device | Not available on this device | Not available on this device |

Table 2-27 Directory Number Configuration for CTI Route Points (continued)

| Field | CTI Route Point 1 Setting | CTI Route Point 2 Setting | CTI Route Point 3 Setting |
|-----------------------------|------------------------------|------------------------------|------------------------------|
| Ring Setting (Phone Active) | Not available on this device | Not available on this device | Not available on this device |
| Character Set | Western European (Latin 1) | Western European (Latin 1) | Western European (Latin 1) |

Device > Gatekeeper

To access the Cisco CallManager Administration web pages for adding and configuring gatekeepers, choose **Device > Gatekeeper** from the Cisco CallManager Administration application.

A primary gatekeeper and an alternate gatekeeper were configured for the Very Large Site model. [Table 2-28](#) describes the settings in the Gatekeeper Configuration page for these gatekeepers.

Table 2-28 Gatekeeper Configuration

| Field | Primary Gatekeeper Settings | Alternate Gatekeeper Settings |
|-----------------------------------|-----------------------------|-------------------------------|
| Host Name/IP Address | 10.3.100.51 | 10.3.100.52 |
| Description | Primary Gatekeeper | Alternate Gatekeeper |
| Registration Request Time To Live | 60 | 60 |
| Registration Retry Timeout | 300 | 300 |
| Enable Device | checked | checked |

Device > Gateway

To access the Cisco CallManager Administration web pages for adding and configuring gateways, choose **Device > Gateway** from the Cisco CallManager Administration application.

This section shows how one analog gateway (Analog-6624) and one digital gateway (Digital-CMM) were configured for the Very Large Site model. One hundred and sixty-two other gateways were configured but are not described in this section.

[Table 2-29](#) describes how the access 4 6624 analog gateway was configured in the Gateway Configuration page. [Table 2-30](#) describes how one of the directory numbers for this analog gateway was configured in the Directory Number Configuration page.

[Table 2-31](#) describes how the ACCESS1-CMM digital gateway was configured in the Gateway Configuration page. [Table 2-32](#) describes how one of the end points for this digital gateway was configured in the Gateway Configuration page.

Table 2-29 Analog Gateway Configuration

| Field | Setting |
|-----------------------------|---------------|
| MAC Address | 001007F338E5 |
| Description | Analog 6624 |
| Device Pool | HQ-CM1-CM2 |
| Load Information | A00203030017 |
| Network Locale | United States |
| Location | <None> |
| AAR Group | <None> |
| Calling Search Space | national_css |
| AAR Calling Search Space | <None> |
| Media Resource Group List | mrgl |
| Network Hold Audio Source | MOH_MOH |
| Port Selection Order | Top Down |
| SNMP Community String | Public |
| Disable SNMP Set operations | Unchecked |

Table 2-30 Directory Number Configuration for Analog-6624 Analog Gateway

| Field | Setting |
|------------------------------|------------------------------|
| Directory Number | 29948 |
| Partition | internal_p |
| Voice Mail Profile | <None> |
| Calling Search Space | national_css |
| AAR Group | <None> |
| Network Hold Audio Source | <None> |
| Forward All | default settings |
| Forward Busy | default settings |
| Forward No Answer | default settings |
| Call Pickup Group | default settings |
| Display (Internal Caller ID) | blank |
| External Phone Number Mask | blank |
| Line Text Label | Not available on this device |
| Message Waiting Lamp Policy | Not available on this device |
| Ring Setting (Phone Idle) | Not available on this device |
| Ring Setting (Phone Active) | Not available on this device |
| Character Set | Western European (Latin1) |

Table 2-31 Digital Gateway Configuration

| Field | Setting |
|-------------------------|------------------------|
| Domain Name | ACCESS1-CMM1.cisco.com |
| Description | Digital-CMM |
| Cisco CallManager Group | 12 |
| Module in Slot 1 | WS-X6600 |
| Subunit | WS-X6600-6T1 |

Table 2-31 Digital Gateway Configuration (continued)

| Field | Setting |
|-------------------------------|-----------|
| Module in Slot 2 | <None> |
| Module in Slot 3 | <None> |
| Module in Slot 4 | <None> |
| Global ISDN Switch Type | DMS-100 |
| Switchback uptime-delay (min) | 10 |
| Switchback schedule (hh:mm) | 12:00 |
| Fax mode | Fax Relay |

Table 2-32 End Point Configuration for Digital-CMM Digital Gateway

| Field | Setting |
|---|---------------------------------|
| End-Point Name | S1/DS1-0@ACCESS1-CMM1.cisco.com |
| Description | S1/DS1-0@ACCESS1-CMM1.cisco.com |
| Device Pool | HQ-CM2-CM1 |
| Network Locale | United States |
| Media Resource Group List | <None> |
| Location | <None> |
| AAR Group | <None> |
| Load Information | blank |
| PRI Protocol Type | PRI DMS-100 |
| Protocol Side | User |
| Channel Selection Order | Bottom Up |
| Channel IE Type | Use Number when 1B |
| Delay for first restart (1/8 sec ticks) | 32 |
| Delay between restarts (1/8 sec ticks) | 4 |
| Inhibit restarts at PRI initialization | Checked |

Table 2-32 End Point Configuration for Digital-CMM Digital Gateway (continued)

| Field | Setting |
|---|--------------|
| Enable status poll | Unchecked |
| Significant Digits | All |
| Calling Search Space | internal_css |
| AAR Calling Search Space | <None> |
| Prefix DN | blank |
| Calling Party Presentation | Allowed |
| Calling Party Selection | Originator |
| Called party IE number type unknown | National |
| Calling party IE number type unknown | National |
| Called Numbering Plan | ISDN |
| Calling Numbering Plan | ISDN |
| Number of digits to strip | 0 |
| Caller ID DN | blank |
| SMDI Base Port | 0 |
| Display IE Delivery | Unchecked |
| Redirecting Number IE Delivery - Outbound | Unchecked |
| Redirecting Number IE Delivery - Inbound | Unchecked |
| Send Extra Leading Character In DisplayIE | Checked |
| Setup non-ISDN Progress Indicator IE Enable | Unchecked |
| MCDN Channel Number Extension Bit Set to Zero | Unchecked |
| Send Calling Name In Facility IE | Unchecked |

Table 2-32 End Point Configuration for Digital-CMM Digital Gateway (continued)

| Field | Setting |
|--------------------------------|---------|
| Interface Identifier Present | Checked |
| Interface Identifier Value | 0 |
| Line Coding | B8ZS |
| Framing | ESF |
| Input Gain (-6..14 db) | 0 |
| Output Attenuation (-6..14 db) | 0 |
| Echo Cancellation Enable | Enable |
| Echo Cancel Coverage (ms) | 64 |

Device > Phone

To access the Cisco CallManager Administration web pages for adding and configuring Cisco IP Phones and Cisco Analog Telephone Adaptors (ATAs), choose **Device > Phone** from the Cisco CallManager Administration application.

This section shows how one phone (Cisco IP Phone 7960) and one ATA (ATA 186) were configured for the Very Large Site model. More than 17,000 other such devices were configured but are not described in this section.



Note

CTI ports were configured by adding a new phone with a Phone Type of CTI Port.

[Table 2-33](#) describes how the Cisco IP Phone 7960 device and the ATA 186 device were configured in the Phone Configuration page. [Table 2-34](#) describes how one of the directory numbers for each of these devices was configured in the Directory Number Configuration page for that device.

Table 2-33 Phone Configuration

| Field | Cisco IP Phone 7960 Setting | ATA 186 Setting |
|---------------------------|------------------------------------|------------------------|
| MAC Address | 00097CEC8E33 | 000AB7447F84 |
| Description | Cisco IP Phone 7960 | ATA 186 |
| Device Pool | HQ-CM4-CM3 | HQ-CM1-CM2 |
| Calling Search Space | internal_css | national_css |
| AAR Calling Search Space | <None> | <None> |
| Media Resource Group List | mrgl | mrgl |
| User Hold Audio Source | MOH_MOH | MOH_MOH |
| Network Hold Audio Source | MOH_MOH | MOH_MOH |
| Location | <None> | <None> |
| User Locale | English United States | <None> |
| Network Locale | United States | <None> |
| Phone Button Template | Standard 7960 | Standard ATA 186 |
| Expansion Module 1 | <None> | — |
| Expansion Module 2 | <None> | — |
| Softkey Template | Standard User | — |
| Phone Load Name | blank | blank |
| Module 1 Load Name | blank | — |
| Module 2 Load Name | blank | — |
| Information | blank | — |
| Directory | blank | — |
| Messages | blank | — |
| Services | blank | — |
| Authentication Server | blank | — |

Table 2-33 Phone Configuration (continued)

| Field | Cisco IP Phone 7960 Setting | ATA 186 Setting |
|-----------------------------------|-------------------------------|-----------------|
| Proxy Server | blank | — |
| Idle | blank | — |
| Idle Timer (seconds) | blank | — |
| Enable Extension Mobility Feature | Checked | — |
| Log Out Profile | <Use Current Device Settings> | — |
| Disable Speakerphone | Unchecked | — |
| Disable Speakerphone and Headset | Unchecked | — |
| Forwarding Delay | Disabled | — |
| PC Port | Enabled | — |
| Settings Access | Enabled | — |
| Gratuitous ARP | Enabled | — |
| PC Voice VLAN Access | Enabled | — |
| Video Capabilities | Disabled | — |
| Auto Line Select | Disabled | — |

Table 2-34 Directory Number Configuration for Phone and ATA

| Field | Cisco IP Phone 7960 Setting | ATA 186 Setting |
|------------------------|-----------------------------|-----------------|
| Directory Number | 29009 | 29901 |
| Partition | internal_p | internal_p |
| Voice Mail Profile | unity1 | <None> |
| Calling Search Space | national_css | national_css |
| AAR Group | <None> | <None> |
| User Hold Audio Source | MOH_MOH | MOH_MOH |

Table 2-34 Directory Number Configuration for Phone and ATA (continued)

| Field | Cisco IP Phone 7960 Setting | ATA 186 Setting |
|------------------------------|--|--|
| Network Hold Audio Source | MOH_MOH | MOH_MOH |
| Call Waiting | Default | On |
| Auto Answer | Auto Answer Off | — |
| Forward All | Voice Mail: Unchecked Destination: blank Calling Search Space: <None> | Voice Mail: Unchecked Destination: blank Calling Search Space: <None> |
| Forward Busy | Voice Mail: Checked Destination: blank Calling Search Space: <None> | Voice Mail: Unchecked Destination: blank Calling Search Space: <None> |
| Forward No Answer | Voice Mail: Checked Destination: blank Calling Search Space: <None> | Voice Mail: Unchecked Destination: blank Calling Search Space: <None> |
| Call Pickup Group | <None> | <None> |
| Display (Internal Caller ID) | 39-29009 | blank |
| External Phone Number Mask | 9193929009 | blank |
| Line Text Label | 39-29009 | — |
| Message Waiting Lamp Policy | Use System Policy | — |
| Ring Setting (Phone Idle) | Use System Default | — |

Table 2-34 Directory Number Configuration for Phone and ATA (continued)

| Field | Cisco IP Phone 7960 Setting | ATA 186 Setting |
|-----------------------------|-----------------------------|----------------------------|
| Ring Setting (Phone Active) | Use System Default | — |
| Character Set | Western European (Latin 1) | Western European (Latin 1) |

Device > Trunk

To access the Cisco CallManager Administration web pages for trunks, choose **Device > Trunk** from the Cisco CallManager Administration application.

The following five trunks were configured for the Very Large Site model. Each trunk was added with the characteristics shown:

- ICT-CM
 - Trunk type: Intercluster Trunk (Non-Gatekeeper Controlled)
 - Device Protocol: Intercluster Trunk
- ICT_to_CM1, ICT_to_CM2, ICT_to_CM3, and ICT_to_CM4
 - Trunk type: Intercluster Trunk (Gatekeeper Controlled)
 - Device Protocol: Intercluster Trunk

[Table 2-35](#) describes the settings in the Trunk Configuration page for the trunks that were configured for the Very Large Site model.

Table 2-35 Trunk Configuration

| Field | Trunk 1 Settings | Trunk 2 Settings | Trunk 3 Settings | Trunk 4 Settings | Trunk 5 Settings |
|-------------|---|------------------|------------------|------------------|------------------|
| Device Name | ICT-CM | ICT_to_CM1 | ICT_to_CM2 | ICT_to_CM3 | ICT_to_CM4 |
| Description | Non-GK-ICT connected to PUBTFTP and CM1 at another site | ICT_to_CM | ICT_to_CM2 | ICT_to_CM3 | ICT_to_CM4 |

Table 2-35 Trunk Configuration (continued)

| Field | Trunk 1 Settings | Trunk 2 Settings | Trunk 3 Settings | Trunk 4 Settings | Trunk 5 Settings |
|--|-------------------|-------------------|-------------------|-------------------|------------------|
| Device Pool | HQ-CM1-CM2 | Standalone_cm1 | Standalone_cm2 | Standalone_cm3 | Standalone_cm4 |
| Media Resource Group List | mrg1 | mrg1 | mrg1 | <None> | mrg1 |
| Location | <None> | <None> | <None> | <None> | <None> |
| AAR Group | <None> | <None> | <None> | <None> | <None> |
| Media Termination Point Required | Unchecked | Checked | Checked | Checked | Checked |
| Significant Digits | All | All | All | All | All |
| Calling Search Space | internal_css | international_css | international_css | international_css | internal_css |
| AAR Calling Search Space | <None> | <None> | <None> | <None> | <None> |
| Prefix DN | blank | blank | blank | blank | blank |
| Redirecting Number IE Delivery - Inbound | Checked | Checked | Checked | Checked | Checked |
| Calling Party Selection | Originator | Originator | Originator | Originator | Originator |
| Calling Party Presentation | Allowed | Default | Default | Default | Default |
| Called party IE number type unknown | Cisco CallManager | Cisco CallManager | Cisco CallManager | National | National |

Table 2-35 Trunk Configuration (continued)

| Field | Trunk 1 Settings | Trunk 2 Settings | Trunk 3 Settings | Trunk 4 Settings | Trunk 5 Settings |
|---|-------------------|-------------------|-------------------|------------------|------------------|
| Calling party IE number type unknown | Cisco CallManager | Cisco CallManager | Cisco CallManager | National | National |
| Called Numbering Plan | Cisco CallManager | Cisco CallManager | Cisco CallManager | ISDN | ISDN |
| Calling Numbering Plan | Cisco CallManager | Cisco CallManager | Cisco CallManager | ISDN | ISDN |
| Caller ID DN | blank | blank | blank | blank | blank |
| Display IE Delivery | checked | checked | checked | checked | checked |
| Redirecting Number IE Delivery - Outbound | checked | checked | checked | checked | checked |
| Server 1 IP Address/ Host Name | 10.3.41.11 | — | — | — | — |
| Server 2 IP Address/ Host Name | blank | — | — | — | — |
| Server 3 IP Address/ Host Name | blank | — | — | — | — |
| Gatekeeper Name | — | 10.3.100.51 | 10.3.100.51 | 10.3.100.51 | 10.3.100.51 |
| Terminal Type | — | Gateway | Gateway | Gateway | Gateway |

Table 2-35 Trunk Configuration (continued)

| Field | Trunk 1 Settings | Trunk 2 Settings | Trunk 3 Settings | Trunk 4 Settings | Trunk 5 Settings |
|-------------------|------------------|------------------|------------------|------------------|------------------|
| Technology Prefix | — | 1#* | 1#* | 1#* | 1#* |
| Zone | — | GK1 | GK1 | GK1 | GK1 |

Device > Device Settings > Device Profile

To access the Cisco CallManager Administration web pages for adding and configuring device profiles, choose **Device > Device Settings > Device Profile** from the Cisco CallManager Administration application.

[Table 2-36](#) describes the settings in the Device Profile page for one of the device profiles that was configured for the Very Large Site model. [Table 2-37](#) shows how one of the directory numbers was configured for the example device profile.

Four other device profiles were configured but are not shown in these tables.

Table 2-36 Device Profile Configuration

| Field | Setting |
|--------------------------|------------------------------|
| User Device Profile Name | em49903 |
| Description | Extension Mobility for 49903 |
| User Hold Audio Source | <None> |
| User Locale | <None> |
| Phone Button Template | 5 line 7960 |
| Expansion Module 1 | <None> |
| Expansion Module 2 | <None> |
| Softkey Template | <None> |
| Login User ID | blank |

Table 2-37 Directory Number Configuration for em49903 Device Profile

| Field | Setting |
|------------------------------|--|
| Directory Number | 49903 |
| Partition | internal_p |
| Voice Mail Profile | <None> |
| Calling Search Space | national_css |
| AAR Group | <None> |
| User Hold Audio Source | <None> |
| Network Hold Audio Source | <None> |
| Call Waiting | Default |
| Auto Answer | Auto Answer Off |
| Forward All | Voice Mail: Unchecked Destination: blank Calling Search Space: <None> |
| Forward Busy | Voice Mail: Unchecked Destination: blank Calling Search Space: <None> |
| Forward No Answer | Voice Mail: Checked Destination: 22100 Calling Search Space: internal_css> |
| Call Pickup Group | <None> |
| Display (Internal Caller ID) | em 49903 |
| External Phone Number Mask | blank |
| Line Text Label | em 49903 |
| Message Waiting Lamp Policy | Use System Policy |
| Ring Setting (Phone Idle) | Use System Default |
| Ring Setting (Phone Active) | Use System Default |
| Character Set | Western European (Latin 1) |

Cisco CallManager User Configuration

This section provides an overview of how Cisco CallManager was configured in the User web pages that you access from Cisco CallManager Administration. It points out selected configuration information that will help you understand how Cisco CallManager was set up to perform most effectively.

To access the Cisco CallManager Administration web pages for configuring users, choose **User > Add a New User** (to add a new user) or choose **User > Global Directory** (to update an existing user) from the Cisco CallManager Administration application.

This section provides information for the following users. Approximately 4,000 other users were configured but are not shown in this table.

- PA Administrator—Example of a JTAPI user created in Cisco CallManager
- Kim Jones—Example of a Cisco Personal Assistant user

[Table 2-38](#) describes the settings in the User Configuration page for these example users.

Table 2-38 User Configuration

| Field | User 1 Settings | User 2 Settings |
|-----------------------------|-----------------------|-----------------------|
| First Name | PA | Kim |
| Last Name | Administrator | Jones |
| User ID | PA | kjones |
| Telephone Number | blank | 25000 |
| Manager User ID | blank | blank |
| Department | blank | blank |
| User Locale | English United States | English United States |
| Enable CTI Application Use | Checked | Unchecked |
| Call Park Retrieval Allowed | Unchecked | Unchecked |
| Associated PC | Not Defined | Not Defined |
| Primary Extension | none | none |

Table 2-38 User Configuration (continued)

| Field | User 1 Settings | User 2 Settings |
|---------------------------------------|-----------------------------------|------------------------|
| ICD Extension | Not Defined | Not Defined |
| Controlled Devices | PA24XXX, PA25XXX, PaMainNumber | none |
| Enable Authentication Proxy Rights | Undefined | Undefined |
| Controlled Device Profiles | none | none |



Cisco Personal Assistant Configuration

This chapter provides an overview of how Cisco Personal Assistant was set up for the Very Large Site model in IP Communications Systems Test Release 2.0 for IPT. This chapter does not include detailed installation and configuration instructions. Rather, it is intended to provide you with guidance as you set up the Cisco Personal Assistant component of your IPT solution.

Cisco Personal Assistant 1.4(2) was installed on a Cisco MCS-7835-1266 server. The Cisco Personal Assistant Speech Server was installed on the same server. These systems were configured according to the instructions in Cisco Personal Assistant documentation. In general, default or recommended configuration values were used.

For detailed information about installing, configuring, and administering Cisco Personal Assistant, refer to Cisco Personal Assistant documentation at this URL:

<http://www.cisco.com/univercd/cc/td/doc/product/voice/assist/assist14/index.htm>

This chapter includes the following topics:

- [Cisco Personal Assistant System Configuration, page 3-2](#)
- [Cisco Personal Assistant Server Configuration, page 3-6](#)

Cisco Personal Assistant System Configuration

The following sections provide an overview of how Cisco Personal Assistant was configured on many of the System menu web pages that you access from Cisco Personal Assistant Administration. These sections do not describe all of the System menu web pages or web page fields. Instead, they point out selected configuration information that will help you understand how Cisco Personal Assistant was set up to perform most effectively.

- [System > Speech Services, page 3-2](#)
- [System > Telephony, page 3-3](#)
- [System > Messaging, page 3-4](#)
- [System > Enhanced TTS, page 3-5](#)

The following sections do not discuss these System menu options:

- AA Prompt—Use default settings
- Dial Rules—Use default settings
- Directory Lookup Rules—Use default settings
- Corporate Directory Settings—Use default settings
- Directory Hierarchy—Use default settings
- Miscellaneous Settings—Use default settings

System > Speech Services

To access the Cisco Personal Assistant Administration web pages for configuring speech services, choose **System > Speech Services** from the Cisco Personal Assistant Administration application.

[Table 3-1](#) describes the settings in the Speech Services Configuration page.

Table 3-1 *Speech Services Configuration*

| Field | Setting |
|-------------------------|---------|
| Daily Automatic Refresh | Checked |
| Refresh Schedule | 02:00 |

Table 3-1 *Speech Services Configuration (continued)*

| Field | Setting |
|--|-----------------------------------|
| Send Refresh Status | Unchecked |
| Administrator E-mail Address | blank |
| License Key | appropriate license key |
| Number of Licenses | 8 Speech Ports (Multiple Locales) |
| Speech Recognition Server Hosts | 10.3.201.64 10.3.201.65 |
| Speech Recognition License Manager Hosts | 10.3.201.64 10.3.201.65 |
| Supported Locales | American English |
| Default Locale | American English |
| Maximum Number for Disambiguation | 3 |
| Allow Barge-in | Checked |
| Rejection Confidence Level | 45 |
| Reconfirm Confidence Level | 60 |
| Max Error Count per Dialog | 3 |
| Max Error Count per Call | 8 |
| Max Help Count per Dialog | 2 |
| Max Help Count per Call | 5 |

System > Telephony

To access the Cisco Personal Assistant Administration web pages for configuring telephony providers, choose **System > Telephony** from the Cisco Personal Assistant Administration application.

[Table 3-2](#) describes two of the telephony providers that were configured in the Telephony Configuration web page. Two other telephony providers were configured but are not shown in this table.

Table 3-2 Telephony Configuration

| Field | Telephony Provider 1 Settings | Telephony Provider 2 Settings |
|---------------------|-------------------------------|-------------------------------|
| Provider | CallManager Publisher 1 | skinny |
| Group Name | — | — |
| Provider Type | Jtapi | Skinny |
| Telephony Providers | 10.3.201.10 | 10.3.201.10 |
| User Name | PA | blank |
| Password | user-entered password | blank |

System > Messaging

To access the Cisco Personal Assistant Administration web pages for configuring messaging, choose **System > Messaging** from the Cisco Personal Assistant Administration application.

[Table 3-3](#) describes the settings in the Messaging Configuration page.

Table 3-3 Messaging Configuration

| Field | Setting |
|--|---|
| Calendar Server Name | Exchange Server 1 |
| Calendar Mailbox Name | Unity Messaging System - Unity Server 1 |
| Paging SMTP Server Name | blank |
| Paging SMTP Server Port | 25 |
| Paging SMTP Domain Name | blank |
| Mailbox Name | Unity Messaging System - Unity Server 1 |
| Number of Cisco Unity Licenses | 72 |
| Redirection Delay (milliseconds) | 4000 |
| Voice Mail Server Name (e.g: VmServer) | blank |
| Pilot Number | blank |

Table 3-3 *Messaging Configuration (continued)*

| Field | Setting |
|--|--|
| Internal DTMF Redirection Sequence | #X#2 |
| External DTMF Redirection Sequence | #X#2 |
| Voice Mail Servers | Server Name: Unity Server 1 Pilot Number: 22100 DTMF Sequence (Internal): #X#2 DTMF Sequence (External): #X#2 |
| Notify Users of PIN Change | Checked |
| Administrator E-mail Address | appropriate e-mail address |
| Unique Attribute for Corporate Directory | mail |
| Unique Attribute for Message Store | mail |

System > Enhanced TTS

To access the Cisco Personal Assistant Administration web pages for configuring enhanced TTS, choose **System > Enhanced TTS** from the Cisco Personal Assistant Administration application.

[Table 3-4](#) describes the settings in the Enhanced TTS Configuration page.

Table 3-4 *Enhanced TTS Configuration*

| Field | Setting |
|--------------------|-------------------------|
| TTS Server Name | PA Server 1 |
| TTS Port Number | 6666 |
| TTS License Key | appropriate license key |
| Number of Licences | 12 ports |

Cisco Personal Assistant Server Configuration

This section provides an overview of how Cisco Personal Assistant was configured in the Server Configuration web page that you access from Cisco Personal Assistant Administration. It points out selected configuration information that will help you understand how Cisco Personal Assistant was set up to perform most effectively.

To access the Server Configuration web page, choose **Server > Server Configuration** from the Cisco Personal Assistant Administration application.

[Table 3-5](#) describes the settings in the Server Configuration page.

Table 3-5 Server Configuration

| Field | Setting |
|--------------------------------------|--------------------------------|
| Server Name | PA Server 1 |
| Hostname or IP Address | 10.3.201.64 |
| Media Termination UDP Beginning Port | 32000 |
| Route Address Provider | CallManager Publisher Server 1 |
| Route Address | 24000 |
| AA Route Address | blank |
| Media Port Provider | skinny |
| Media Port Beginning Address | 29801 |
| Number of Media Ports | 40 |
| Interceptor Port Provider | CallManager Publisher Server 1 |
| Interceptor Ports | 24XXX 25XXX |
| Fail-over Server Names | blank |
| Trace Package List | all options Checked |
| Debug Package List | all options checked |



Cisco Emergency Responder Configuration

This chapter provides an overview of how Cisco Emergency Responder was set up for the Very Large Site model in IP Communications Systems Test Release 2.0 for IPT. This chapter does not include detailed installation and configuration instructions. Rather, it is intended to provide you with guidance as you set up the Cisco Unity Emergency Responder in your IPT solution.

Cisco Emergency Responder 1.2(1) was installed on a Cisco MCS-7845H-2.4-EVV1 server and configured according to the instructions in the Cisco Emergency Responder documentation. In general, default or recommended configuration values were used.

For detailed information about installing, configuring, and administering Cisco Emergency Responder, refer to the Cisco Emergency Responder documentation at this URL:

<http://www.cisco.com/univercd/cc/td/doc/product/voice/respond/res12/index.htm>

The this chapter includes the following topics:

- [Cisco Emergency Responder CER Groups, page 4-2](#)
- [Cisco Emergency Responder ERL, page 4-3](#)
- [Cisco Emergency Responder Phone Tracking, page 4-4](#)

Cisco Emergency Responder CER Groups

The following sections provide an overview of how Cisco Emergency Responder was configured on some of the CER Groups menu web pages that you access from Cisco Emergency Responder Administration. These sections do not describe all of the CER Groups menu web pages or web page fields. Instead, they point out selected configuration information that will help you understand how Cisco Emergency Responder was set up to perform most effectively.

- [CER Groups > CER Group Settings, page 4-2](#)
- [CER Groups > Telephony Settings, page 4-3](#)

The following sections do not discuss these CER Groups menu options:

- Server settings—Use recommended settings
- License Manager—Use recommended settings
- Control Center—Use recommended setting

CER Groups > CER Group Settings

To access the Cisco Emergency Responder Administration web pages for configuring group settings, choose **CER Groups > CER Group settings** from the Cisco Emergency Responder Administration application.

[Table 4-1](#) describes the settings in the CER Group Settings page.

Table 4-1 CER Group Settings Configuration

| Field | Setting |
|-------------------------------|---|
| CER Group Name | 10.3.201.10 Note This IP address is that of the Publisher |
| Peer TCP Port | 17001 |
| Heart beat Count | 3 |
| Heart beat Interval (in sec) | 30 |
| Active Call Time out (in min) | 180 |
| SMTP Mail Server | blank |

Table 4-1 CER Group Settings Configuration (continued)

| Field | Setting |
|------------------------------|---------|
| Source Mail ID | blank |
| System Administrator Mail ID | blank |
| SysLog | disable |
| Syslog Server | blank |

CER Groups > Telephony Settings

To access the Cisco Emergency Responder Administration web pages for configuring telephony settings, choose **CER Groups > Telephony settings** from the Cisco Emergency Responder Administration application.

[Table 4-2](#) describes the settings in the Telephony Settings page.

Table 4-2 Telephony Settings Configuration

| Field | Setting |
|------------------------------------|---------------|
| UDP Port Begin | 32000 |
| Inter CER Group Route Pattern | 1000.911 |
| PSAP Callback Route Point Pattern | 913XXXXXXXXXX |
| ELIN Digit Strip Pattern | 913 |
| Route Point for Primary CER Server | 911 |
| Route Point for Standby CER Server | 912 |

Cisco Emergency Responder ERL

This section provides an overview of how Cisco Emergency Responder was configured in the ERL menu web pages that you access from Cisco Emergency Responder Administration. It points out selected configuration information that will help you understand how Cisco Emergency Responder was set up to perform most effectively.

Four onsite alerts were set for the very large site model. These alerts were entered in the Onsite Alert Settings page (**ERL > Onsite Alert settings**) using site-appropriate values for Onsite Alert ID, Contact Name, Contact Number, and Email Address.

Table 4-3 describes how one of the onsite alerts was configured in the ERL Information page. You access this page from the Cisco Emergency Responder Administration application by choosing **ERL > ERL Details** and selecting the desired Onsite Alert.

Table 4-3 Onsite Alert Settings Configuration

| Field | Setting |
|-----------------------|---|
| ERL Name | Default |
| ELIN Settings | Route/Translation pattern: 10.911 ELIN: 6013929911 |
| Onsite Alert Settings | Available Onsite Alert IDs: 29001 29063 29061 Onsite Alert IDs for the ERL 29026 |

Cisco Emergency Responder Phone Tracking

This section provides an overview of how Cisco Emergency Responder was configured in the Cisco CallManager Details menu web page that you access from Cisco Emergency Responder Administration. It points out selected configuration information that will help you understand how Cisco Emergency Responder was set up to perform most effectively.

This section does not discuss these Phone Tracking menu web pages:

- SNMP Settings—Use recommended settings
- Schedule—Use recommended settings
- LAN Switch Details—Use recommended settings

To access the Cisco Emergency Responder Administration web pages for configuring Cisco CallManager details, choose **Phone Tracking > Cisco CallManager Details** from the Cisco Emergency Responder Administration application.

Table 4-4 describes how Cisco CallManager Details were configured in the Cisco CallManager Details page.

Table 4-4 Cisco CallManager Details

| Field | Setting |
|------------------------------|--|
| Cisco CallManager | 10.3.211.10 |
| CTI Manager | 10.3.211.10 Note This IP address is that of Cisco CallManager 1 |
| CTI Manager User Name | cer Note This user name is defined in Cisco CallManager and is associated with all CTI route points and the CTI port |
| CTI Manager Password | Password specified for the user “cer” in Cisco CallManager |
| BackUp CTI Manager 1 | 10.3.213.10 |
| BackUp CTI Manager 2 | blank |
| Telephony Port Begin Address | 50001 |
| Number of Telephony Ports | 3 |



Cisco Unity and Cisco Unity Bridge Configuration

This chapter provides an overview of how Cisco Unity and Cisco Unity Bridge were set up for the Very Large Site model in IP Communications Systems Test Release 2.0 for IPT. This chapter does not include detailed installation and configuration instructions. Rather, it is intended to provide you with guidance as you set up the Cisco Unity and Cisco Unity Bridge components of your IPT solution.

Cisco Unity 4.0(3) was installed on multiple Compaq ML570 with quad processor servers and configured according to the instructions in the Cisco Unity documentation. Cisco Unity Bridge 3.0(1) was installed on an IBM x205 server and configured according to the instructions in the Cisco Unity Bridge documentation. In general, default or recommended configuration values were used for both applications.

For detailed information about installing, configuring, and administering Cisco Unity and Cisco Unity Bridge, refer to the documentation for these products at this URL:

http://www.cisco.com/univercd/cc/td/doc/product/voice/c_unity/index.htm

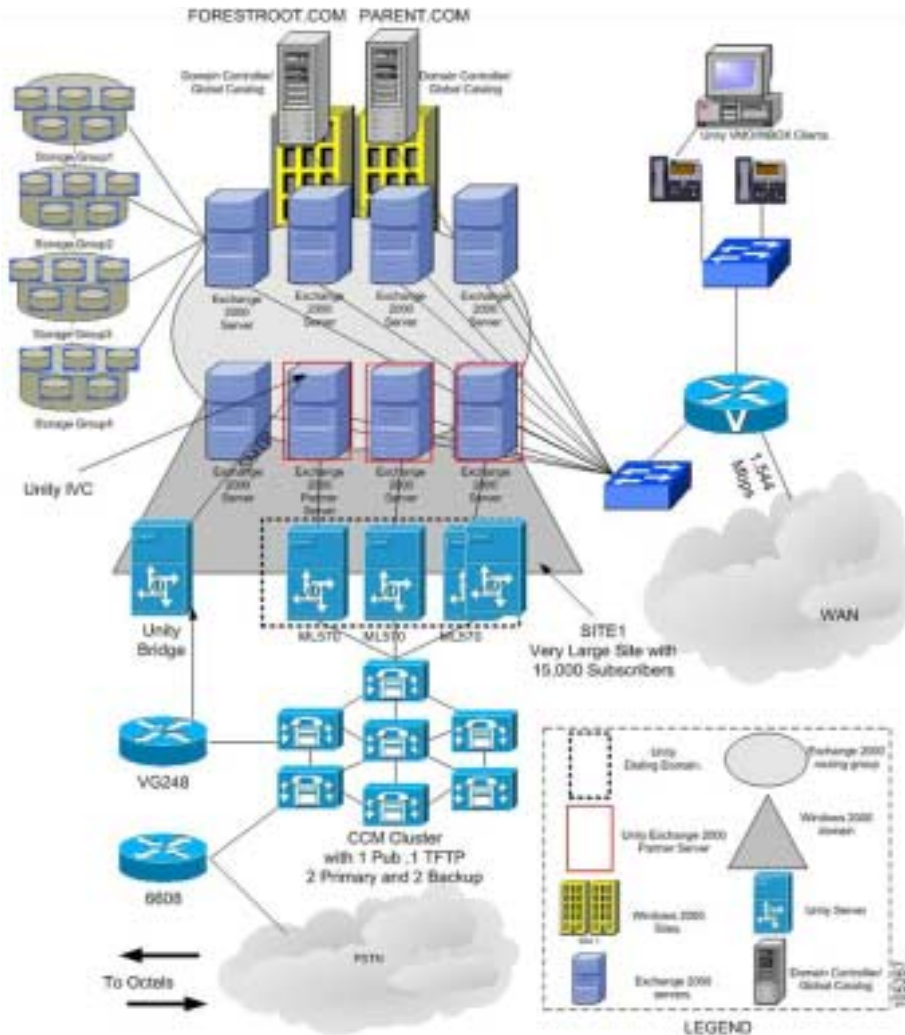
The this chapter includes the following topics:

- [Cisco Unity and Cisco Unity Bridge Topology, page 5-2](#)
- [Cisco Unity Configuration, page 5-3](#)
- [Cisco Unity Bridge Configuration, page 5-4](#)

Cisco Unity and Cisco Unity Bridge Topology

Figure 5-1 provides a graphical representation of how Cisco Unity and Cisco Unity Bridge were set up in the Very Large Site model.

Figure 5-1 Cisco Unity and Cisco Unity Bridge Topology for Very Large Site Model



Cisco Unity Configuration

This section provides an overview of how Cisco Unity was set up and configured in the Very Large Site model.

- Four Cisco Unity servers were deployed based on the number of users or subscribers and the number of voice mail ports required for the maximum call volume.
- Each Cisco Unity server was configured with a separate Voice Mail Profile in Cisco CallManager. In this way, each Cisco Unity subscriber was assigned a corresponding voice mail profile in Cisco CallManager Phone Configuration.
- Cisco CallManager voice mail profiles were configured so that a Cisco Unity subscriber is directed automatically to the appropriate Cisco Unity server when the subscriber presses the **Messages** button on the Cisco IP Phone. [Table 5-1](#) describes how Cisco CallManager voice mail profiles were set up.

Table 5-1 Cisco CallManager Voice Mail Profiles for Cisco Unity

| Cisco CallManager Device Pool | Unity Server | Cisco CallManager Voice Mail Profile | Phone Extension |
|-------------------------------|--------------------------------|--------------------------------------|--------------------------|
| HQ-CM1-CM2 | Unity 1 and Unity 2 (failover) | 22100/Unity_css | all phones in building 1 |
| HQ-CM3-CM4 | Unity 3 | 22300/Unity_css | all phones in building 2 |
| HQ-CM4-CM3 | Unity 4 | 22400/Unity_css | all phones in building 3 |

- Because all Cisco Unity servers were in the same site, they were in the same domain. Therefore, the same installation account, Message store service account, and directory service account were used for all Cisco Unity servers.
- Approximately 10% of the Cisco Unity voice mail ports were reserved for message waiting indication (MWI).
- Each Cisco Unity Unified Messaging subscriber was assigned a class of service based on the following features:
 - Text to Speech
 - Cisco Unity Assistant (CPCA)
 - Cisco Unity Inbox

Cisco Unity Bridge Configuration

This section provides an overview of how Cisco Unity Bridge was set up and configured in the Very Large Site model.

- For each Cisco Unity Bridge subscriber, information entered in the Cisco Unity System Administration Subscribers web page included the following:
 - Unity Node Serial Number—Same serial number as configured in Cisco Unity Bridge
 - Legacy Mailbox ID
- Information entered in the Cisco Unity Bridge Administration Unity Nodes web page included the following:
 - Serial Number—Same serial number as configured in Cisco Unity Bridge
 - Unity SNMP mail suffix—Domain in which the corresponding Cisco Unity Bridgehead and Microsoft Exchange 2000 server that contains the Internet Voice Connector (IVC) are located
- Information entered in the Cisco Unity Bridge Administration Octel Nodes web page included the following:
 - Serial Number—Serial number of the Octel node
 - Phone Number—Phone number to reach the Octel node
- Information entered in the Cisco Unity Bridge Administration Digital Networking web page included the following:
 - ESMTP Server—IP address of the Microsoft Exchange 2000 server that contains the IVC



Cisco Customer Response Applications Configuration

This chapter provides an overview of how Cisco Customer Response Applications (Cisco CRA) was set up for the Very Large Site model in IP Communications Systems Test Release 2.0 for IPT.



Note

Effective with release 3.0, Cisco Customer Response Applications (CRA) has been renamed Cisco Customer Response Solutions (CRS) and, effective with release 3.1, is marketed under the names IPCC Express and IP IVR. The Cisco website and packaging materials have been updated to reflect the new name, but the user interface, and therefore the documentation, have not.

This chapter does not include detailed installation and configuration instructions. Rather, it is intended to provide you with a call center example and with guidance as you set up the Cisco CRA component of your IPT solution.

The following servers were used for Cisco CRA 3.1(2) SR6:

- Cisco CRA Server—Cisco MCS-7845H-2.4-CC1
- ICD Call Statistics, Recording, and Monitoring Server—Cisco MCS-7825-1133
- Automatic speech recognition (ASR) Server—Cisco MCS-7825-1133

In general, default or recommended configuration values were used during installation and setup. For detailed information about installing, configuring, and administering Cisco CRA, refer to the Cisco CRA documentation at this URL:

http://www.cisco.com/univercd/cc/td/doc/product/voice/sw_ap_to/apps_3_1/index.htm

The this chapter includes the following topics:

- [Overview, page 6-2](#)
- [Cisco CallManager Configuration for Cisco CRA System, page 6-3](#)
- [CSQ Configuration, page 6-3](#)
- [Workflows for IVR Menu Choices, page 6-5](#)

Overview

For the Very Large Site model in IP Communications Systems Test Release 2.0 for IPT, a call center with the following characteristics was configured:

- Operational 24 hours a day, 7 days a week.
- 150 Agents.
- Agents grouped by their support function. The Cisco CRA system routes calls to the contact service queue (CSQ) for the appropriate group.
- Automatic speech recognition (ASR) support for accessing menu choices.
- Callers to the call center access a menu that offers the following choices:
 - Press 1 for Computer Hardware and Operating System Support.
 - Press 2 for Standard Desktop Software Support.
 - Press 3 for Financial and Trading Applications Support.
 - Press 4 for Reporting Applications Support.
 - Press 5 for Network and Password Support.
 - Press 8 for the Executive System Support.

Cisco CallManager Configuration for Cisco CRA System

[Table 6-1](#) describes how Cisco CallManager was configured to work with the sample Cisco CRA system that is described in this chapter.

For additional information about Cisco CallManager configuration for the Very Large Site model, see [Chapter 2, “Cisco CallManager Configuration.”](#)

Table 6-1 Cisco CallManager Configuration for Cisco CRA

| Configuration Item | Quantity Configured | Associated Item |
|--------------------|---------------------|-------------------|
| Agent | 150 | Phone |
| CTI Port | 145 | JTAPI User |
| JTAPI USER | 1 | — |
| Phone | 150 | Agent and RM User |
| RM USER | 1 | — |
| Route Point | 8 | JTAPI User |

In addition, the following CTI Managers were configured in Cisco CallManager:

- CM4—Primary CTI Manager
- CM2—Backup CTI Manager for redundancy

CSQ Configuration

[Table 6-2](#) describes the resource groups that were configured in Cisco CRA Administration. Each resource group has an associated CSQ, which was also configured in Cisco CRA Administration.

Table 6-2 Cisco CRA Resource Groups

| Resource Group Name | Description | Number of Agents |
|---------------------|---|------------------|
| CHOS | Computing Hardware and Operating System Support | 19 |
| SDSS | Standard Desktop Software Support | 21 |
| FAT | Financial and Trading Applications Support | 42 |
| RAS | Reporting Applications Support | 18 |
| NPS | Network and Password Support | 45 |
| EIS | Executive System Support | 5 |

[Table 6-3](#) describes the skill groups that were configured in Cisco CRA Administration. This example assumes that some agents have more than one skill.

Table 6-3 Cisco CRA Skill Groups

| Skill Group Name | Description | Number of Agents |
|------------------|--|------------------|
| S_SDSS | Agents cross-trained in Standard Desktop Software Support | 6 |
| S_EIS | Agents cross-trained in Executive Information Support | 3 |
| S_FAT | Agents cross-trained in Financial and trading Applications Support | 4 |

[Table 6-4](#) describes how a resource-based CSQ (named CHOS) and a skills-based CSQ (named S_SDSS) were configured in Cisco CRA Administration. These skills were configured in the Contact Service Queue Configuration area in the ICD Configuration web page.

Table 6-4 Cisco CRA CSQ Configuration

| Field | CHOS Setting | S_SDSS Setting |
|-------------------------------|----------------------|---------------------|
| Contact Service Queue Name | CHOS | S_SDSS |
| Contact Queuing Criteria | FIFO | FIFO |
| Automatic Work | Disabled | Disabled |
| Resource Pool Selection Model | Resource Group | Resource Skill |
| Service Level | 20 | 20 |
| Service Level Percentage | 80 | 80 |
| Resource Selection Criteria | Longest Available | Longest Available |
| Assigned Skills | — | S_SDSS(5) |
| Resource Group | CHOS_RG | — |
| Show Resources | 19 agents configured | 6 agents configured |

Workflows for IVR Menu Choices

The following sections describe the workflows that were associated with each of the IVR menu choices in Cisco CRA Administration:

- [Computing Hardware and Operating System Support, page 6-6](#)
- [Standard Desktop Software Support, page 6-6](#)
- [Financial and Trading Application Support, page 6-6](#)
- [Reporting Application Support, page 6-7](#)
- [Network and Password Support, page 6-7](#)
- [Executive System Support, page 6-7](#)

Computing Hardware and Operating System Support

A caller who selects the option for Computing Hardware and Operating System Support is queued for an agent with the longest time available in the CHOS resource group.

A caller who is in queue for more than 2 minutes is given the options to continue to hold or to be transferred to voice mail.

Standard Desktop Software Support

A caller who selects the option for Standard Desktop Software Support is queued for an agent with the longest time available in the SDSS resource group. If an agent is not available within 90 seconds, the system considers other agents who are in the S_SDSS skill group.

An Enterprise Data pop-up window provides an agent with information about which resource group the call was queued for.

A caller who is in queue for more than 4 minutes is given the options to continue to hold or to be transferred to voice mail.

Financial and Trading Application Support

A caller who selects the option for Financial and Trading Application Support is queued for an agent with the longest time available in the FAT resource group. If an agent is not available within 60 seconds, the system considers other agents who are in the S_FAT skill group.

An Enterprise Data pop-up window provides an agent with information about which resource group the call was queued for.

A caller who is in queue for more than 2 minutes is given the options to continue to hold or to be transferred to voice mail.

Reporting Application Support

A caller who selects the option for Reporting Application Support before 10:00 a.m. (1000) hears a message that daily reports may not have been generated. The message asks the caller to try again later. Then the call is terminated.

A caller who selects the option for Reporting Application Support after 10:00 a.m. (1000) is queued for an agent with the longest time available in the RAS resource group.

A caller who is in queue for more than 3 minutes is the given options to continue to hold or to be transferred to voice mail.

Network and Password Support

A caller who selects the option for Network and Password Support is queued for an agent with the longest time available in the NPS resource group.

A caller who is in queue for more than 5 minutes is the given options to continue to hold or to be transferred to voice mail.

Executive System Support

A caller who selects the option for Executive System Support is queued for an agent with the longest time available in the EIS resource group. If an agent is not available within 60 seconds, the system considers agents from other groups with the S_EIS skill.



Hardware Configurations

This chapter provides sample configuration files and configuration information for selected hardware components in the Very Large Site model. The configuration files and information in this chapter apply to Multi-Site Distributed scenarios.

The this chapter includes the following topics:

- [Cisco 3660 Gatekeeper Configuration, page 7-1](#)
- [Cisco 3745 CAMA Gateway Configuration, page 7-5](#)

Cisco 3660 Gatekeeper Configuration

This section shows configuration files for the Cisco 3660 12.2(15)T9 gatekeepers used in the Very Large Site model.

Two gatekeepers were configured:

- GK1—Primary gatekeeper. See the “[GK1 Configuration](#)” section on [page 7-2](#)
- GK2—Alternate gatekeeper See the “[GK2 Configuration](#)” section on [page 7-3](#)

For related information, refer to the Cisco High-Performance Gatekeeper documentation at this URL:

http://www.cisco.com/en/US/products/sw/iosswrel/ps5013/products_feature_gui_de09186a0080080e92.html

GK1 Configuration

This section shows a configuration file for the Cisco 3660 12.2(15)T9 gatekeeper that was configured as the primary gatekeeper in the Very Large Site model.

```

service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname Very_Large_Site-GK1
!
logging queue-limit 100
logging buffered 1000000 debugging
enable password password
!
ip subnet-zero
!
voice call carrier capacity active
!
interface FastEthernet0/0
  no ip address
  shutdown
  duplex auto
  speed auto
!
interface FastEthernet0/1
  description Connection to CORE1 Port 3/38
  ip address 10.3.100.51 255.255.255.0
  speed 100
  full-duplex
!
ip http server
ip classless
ip route 0.0.0.0 0.0.0.0 10.3.100.1
!
access-list 101 deny ip host 10.3.221.10 host 10.3.100.51
access-list 101 permit ip any any
snmp-server community public RO
snmp-server enable traps tty
!
dial-peer cor custom
!
gatekeeper
  zone local Very_Large_Site-GK1 cisco.com 10.3.100.51
  zone remote Large_Site-GK1 cisco.com 10.3.30.3 1719
  zone cluster local west-cluster Very_Large_Site-GK1
    element Very_Large_Site-GK2 10.3.100.52 1719

```



```

!
zone prefix Very_Large_Site-GK1 6011* gw-default-priority 0
zone prefix Very_Large_Site-GK1 60120* gw-default-priority 0
zone prefix Very_Large_Site-GK1 60139* gw-priority 10
Very_Large_Site_ict_to_cm3_4
Very_Large_Site_ict_to_cm4_5 Very_Large_Site_ict_to_cm2_3
Very_Large_Site_ict_to_cm1_2
zone prefix Very_Large_Site-GK1 60139* gw-default-priority 0
zone prefix Very_Large_Site-GK1 60144* gw-priority 10
Small_Site_CallManager_2
zone prefix Very_Large_Site-GK1 60144* gw-default-priority 0
zone prefix Very_Large_Site-GK1 60172* gw-priority 10
Small_Site_CallManager_2
zone prefix Very_Large_Site-GK1 60172* gw-default-priority 0
zone prefix Very_Large_Site-GK1 60193* gw-priority 10
Medium_Site_CallManager_2
zone prefix Very_Large_Site-GK1 60193* gw-priority 8
Medium_Site__CallManager_1
zone prefix Very_Large_Site-GK1 60193* gw-default-priority 0
zone prefix LArge_Site-GK1 *
gw-type-prefix 1#* default-technology
lrq forward-queries
bandwidth total zone Very_Large_Site-GK1 4632000
no shutdown
!
line con 0
line aux 0
line vty 0 4
password password
login
!
ntp clock-period 17180299
ntp server 172.18.137.110
!
end

```

GK2 Configuration

This section shows a configuration file for the Cisco 3660 12.2(15)T9 gatekeeper that was configured as the alternate gatekeeper in the Very Large Site model.

```

version 12.2
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption

```

```

!
hostname Very_Large_Site-GK2
!
logging queue-limit 100
enable password password
!
ip subnet-zero
!
voice call carrier capacity active
!
interface FastEthernet0/0
  no ip address
  shutdown
  duplex auto
  speed auto
!
interface FastEthernet0/1
  ip address 10.3.100.52 255.255.255.0
  ip access-group 101 in
  speed 100
  full-duplex
!
ip http server
ip classless
ip route 0.0.0.0 0.0.0.0 10.3.100.1
!
access-list 101 deny ip host 10.3.221.10 host 10.3.100.52
access-list 101 permit ip any any
snmp-server community public RO
snmp-server enable traps tty
!
dial-peer cor custom
!
gatekeeper
  zone local Very_Large_Site-GK2 cisco.com 10.3.100.52
  zone cluster local west-cluster Very_Large_Site-GK2
    element Very_Large_Site-GK1 10.3.100.51 1719
  !
  zone prefix Very_Large_Site-GK2 6011* gw-default-priority 0
  zone prefix Very_Large_Site-GK2 60120* gw-default-priority 0
  zone prefix Very_Large_Site-GK2 60139* gw-priority 10
Very_Large_Site_ict_to_cm3_4
Very_Large_Site_ict_to_cm1_2 Very_Large_Site_ict_to_cm2_3
Very_Large_Site_ict_to_cm4_5
  zone prefix Very_Large_Site-GK2 60139* gw-default-priority 0
  zone prefix Very_Large_Site-GK2 60144* gw-priority 10
Small_Site_CallManager_2
  zone prefix Very_Large_Site-GK2 60144* gw-default-priority 0

```

```
zone prefix Very_Large_Site-GK2 60172* gw-priority 10
Small_Site_CallManager_2
zone prefix Very_Large_Site-GK2 60172* gw-default-priority 0
zone prefix Very_Large_Site-GK2 60193* gw-priority 10
Medium_Site__CallManager_2
zone prefix Very_Large_Site-GK2 60193* gw-priority 8
Medium_Site__CallManager_1
zone prefix Very_Large_Site-GK2 60193* gw-default-priority 0
gw-type-prefix 1#* default-technology
lrq forward-queries
bandwidth total zone Very_Large_Site-GK2 4632000
shutdown
!
line con 0
line aux 0
line vty 0 4
password password
login
!
ntp clock-period 17180297
ntp server 172.18.137.110
!
end
```

Cisco 3745 CAMA Gateway Configuration

For the Cisco 3745 12.2(15)ZJ3 gateway used in the Very Large Site model, the standard H.323 gateway configuration file was used, with the following additions. These lines are required for CAMA (Centralized Automatic Message Accounting) operation.

```
voice-port 4/1/0
signal cama KP-0-NPA-NXX-XXXX-ST
```

For related information, refer to the Analog Centralized Automatic Message Accounting E911 Trunk documentation at this URL:

http://www.cisco.com/en/US/products/sw/iosswrel/ps1839/products_feature_guide09186a00800b5d63.html



Fax, Modem, and TTY/TDD Configurations

This chapter provides an overview of how gateway devices were configured for fax/modem pass-through and fax relay modes for IP Communications Systems Test Release 2.0 for IPT. These configurations were designed to provide the following:

- Interoperability between Media Gateway Control Protocol (MGCP) and H.323 gateway devices.
- Fax/modem call flows that support IP-to-IP, IP-to-PSTN, and PSTN-to-IP calls. PSTN calls may be either T1 or E1 in origination and termination.

This chapter does not include detailed installation and configuration instructions. Rather, it is intended to provide you with guidance as you set up gateway devices in your IPT solution.

This chapter includes the following topics:

- [Overview, page 8-1](#)
- [Fax/Modem Pass-Through/Up Speed Configuration, page 8-2](#)
- [Fax Relay Configuration, page 8-10](#)

Overview

Gateway devices were manually configured using a command line interface (CLI), with the exception of the VG248, Digital-CMM, Digital-6608, and Analog-6624. These devices were configured through a CLI or from

Cisco CallManager Administration. When you configure these devices for fax using Cisco CallManager Administration, you perform this configuration on a per-port basis. See the [“Cisco CallManager Device Configuration”](#) section on [page 2-27](#) for more information.

Port specific parameters for the VG248, such as MWI method, Input/Output gain, and fax relay are configurable from the VG248 console and from Cisco CallManager Administration. (These parameters are called Product Specific Configuration in Cisco CallManager Administration.) However, unlike it does for the the IOS MGCP gateways, Cisco CallManager does not download the Product Specific Configuration parameters (port specific parameters) to the VG248 gateway. You must manually configure these parameters on the VG248 console for them to be effective.

**Note**

For bandwidth consumption for fax up speed (G.729 to G.711), Cisco CallManager is unaware of the increase in bandwidth use after the negotiated codec switches to G.711. This situation can reduce the efficiency of the Call Admission Control (CAC) mechanisms (location-based CAC or Gatekeeper-CAC). In this case, the bandwidth calculation for CAC is no longer a simple function of the Codec bandwidth usage times the number of concurrent calls to support, and some buffer should be allowed for fax up speed.

There are no special configuration commands on the gateway devices for TTY/TDD, except that all call flows must be G.711 codec regions and have a less than 0.1% RTP packet drop rate in the network. Packet drop rates above this threshold could result in TTY/TDD calls having error rate above the comfortable threshold for meaningful conversations.

Fax/Modem Pass-Through/Up Speed Configuration

The following sections show configuration files for H.323 and MGCP gateway devices in fax/modem pass-through mode:

- [H.323 Fax/Modem Pass-Through Configuration, page 8-3](#)
- [MGCP Fax/Modem Pass-Through Configuration, page 8-8](#)

H.323 Fax/Modem Pass-Through Configuration

This section shows a H.323 fax/modem pass-through configuration file.

The following commands must be configured for the H.323 gateway:

- `modem passthrough nse codec g711ulaw`
- `fax protocol pass-through g711 ulaw`

If the `fax protocol pass-through g711 ulaw` command is missing, the gateway device will always perform fax relay, even if `modem pass-through` is configured.

```
version 12.2
service nagle
no service pad
service timestamps debug datetime msec localtime
service timestamps log datetime msec localtime
no service password-encryption
!
hostname apl-2611-h
!
logging queue-limit 100
!
clock timezone SG 8
voice-card 1
!
ip subnet-zero
!
no ip domain lookup
ip domain name lab.com
!
isdn switch-type primary-ni
!
voice class codec 1
  codec preference 1 g711ulaw
  codec preference 2 g711alaw
  codec preference 3 g729br8
  codec preference 4 g729r8
!
voice class h323 1
  h225 timeout tcp establish 5
!
no voice hpi capture buffer
no voice hpi capture destination
!
mta receive maximum-recipients 0
!
```

```

controller T1 1/0
  framing esf
  linecode b8zs
  cablelength short 133
  pri-group timeslots 1-24
!
controller T1 1/1
  framing esf
  linecode b8zs
  pri-group timeslots 1-24
!
interface FastEthernet0/0
  ip address 10.0.0.0 192.168.0.0
  speed 100
  full-duplex
!
interface FastEthernet0/1
  no ip address
  shutdown
  duplex auto
  speed auto
!
interface Serial1/0:23
  no ip address
  no logging event link-status
  isdn switch-type primary-ni
  isdn incoming-voice voice
  no cdp enable
!
interface Serial1/1:23
  no ip address
  no logging event link-status
  isdn switch-type primary-ni
  isdn protocol-emulate network
  isdn incoming-voice voice
  no cdp enable
!
no ip http server
ip classless
ip route 0.0.0.0 0.0.0.0 10.0.0.0
!
snmp-server community private RW
snmp-server community public RO
snmp-server enable traps tty
snmp-server host 10.0.0.0 version 2c private
call rsvp-sync
!
voice-port 1/0:23

```



```
!
voice-port 1/1:23
!
mgcp profile default
!
dial-peer cor custom
!
dial-peer voice 1 pots
  description Incoming POTS
  incoming called-number .T
  direct-inward-dial
  forward-digits all
!
dial-peer voice 2 voip
  description Outgoing VOIP to primary CCM ap1-cml
  preference 10
  destination-pattern 1.....
  progress_ind setup enable 3
  modem passthrough nse codec g711ulaw
  voice-class codec 1
  voice-class h323 1
  session target ipv4:10.0.0.0
  dtmf-relay h245-alphanumeric
  fax protocol pass-through g711ulaw
!
dial-peer voice 3 voip
  description Outgoing VOIP to secondary CCM ap1-pub
  preference 5
  destination-pattern 1.....
  progress_ind setup enable 3
  modem passthrough nse codec g711ulaw
  voice-class codec 1
  voice-class h323 1
  session target ipv4:10.0.0.0
  dtmf-relay h245-alphanumeric
  fax protocol pass-through g711ulaw
!
dial-peer voice 26 pots
  description Outgoing POTS to other gateway via PSTN
  destination-pattern [2-6].....
  port 1/0:23
  forward-digits all
!
dial-peer voice 98 pots
  description Outgoing POTS to DCOSS
  destination-pattern 98.....
  port 1/1:23
  forward-digits all
```

```

!
dial-peer voice 99 pots
  description Outgoing POTS to PSTN
  destination-pattern 99.....
  port 1/0:23
  forward-digits all
!
dial-peer voice 71 voip
  description outgoing VOIP to secondary CCM ap1-pub
  preference 10
  destination-pattern 7.....
  progress_ind setup enable 3
  modem passthrough nse codec g711ulaw
  voice-class codec 1
  voice-class h323 1
  session target ipv4:10.0.0.0
  fax protocol pass-through g711ulaw
!
dial-peer voice 72 voip
  description outgoing VOIP to primary CCM ap1-cm1
  preference 5
  destination-pattern 7.....
  progress_ind setup enable 3
  modem passthrough nse codec g711ulaw
  voice-class codec 1
  voice-class h323 1
  session target ipv4:10.0.0.0
  fax protocol pass-through g711ulaw
!
dial-peer voice 81 voip
  description outgoing VOIP to secondary CCM ap1-pub
  preference 10
  destination-pattern 8.....
  progress_ind setup enable 3
  modem passthrough nse codec g711ulaw
  voice-class codec 1
  voice-class h323 1
  session target ipv4:10.0.0.0
  fax protocol pass-through g711ulaw
!
dial-peer voice 82 voip
  description outgoing VOIP to primary CCM ap1-cm1
  preference 5
  destination-pattern 8.....
  progress_ind setup enable 3
  modem passthrough nse codec g711ulaw
  voice-class codec 1
  voice-class h323 1

```

```
session target ipv4:10.0.0.0
fax protocol pass-through g711ulaw
!
dial-peer voice 91 voip
description outgoing VOIP to secondary CCM apl-pub
preference 10
destination-pattern 9.....
progress_ind setup enable 3
modem passthrough nse codec g711ulaw
voice-class codec 1
voice-class h323 1
session target ipv4:10.0.0.0
fax protocol pass-through g711ulaw
!
dial-peer voice 92 voip
description outgoing VOIP to primary CCM apl-cml
preference 5
destination-pattern 9.....
progress_ind setup enable 3
modem passthrough nse codec g711ulaw
voice-class codec 1
voice-class h323 1
session target ipv4:10.0.0.0
fax protocol pass-through g711ulaw
!
dial-peer voice 100 voip
incoming called-number T
modem passthrough nse codec g711ulaw
voice-class codec 1
voice-class h323 1
fax protocol pass-through g711ulaw
!
dial-peer voice 90 pots
description Outgoing Modem to PSTN
destination-pattern 90.....
port 1/0:23
forward-digits all
!
line con 0
line aux 0
line vty 0 4
login
!
ntp clock-period 17208230
ntp server 10.0.0.0
!
end
```

MGCP Fax/Modem Pass-Through Configuration

This section shows a MGCP fax/modem pass-through configuration file.

The following commands must be configured for the MGCP gateway:

- `no ccm-manager fax protocol cisco`
- `mgcp modem passthrough voip mode nse`

If the `no ccm-manager fax protocol cisco` command is missing, the gateway device will always perform fax relay, even if modem pass-through is configured

```

version 12.2
service nagle
no service pad
service timestamps debug datetime msec localtime
service timestamps log datetime msec localtime
no service password-encryption
!
hostname apl-2691-m
!
logging queue-limit 100
logging buffered 3000000 debugging
!
clock timezone SG 8
voice-card 1
  dspfarm
!
ip subnet-zero
ip tcp synwait-time 13
!
!
no ip domain lookup
ip domain name lab.com
!
isdn switch-type primary-ni
!
no voice hpi capture buffer
no voice hpi capture destination
!
ccm-manager redundant-host 10.0.0.0
ccm-manager mgcp
no ccm-manager fax protocol cisco
ccm-manager music-on-hold
ccm-manager config server 10.0.0.0
ccm-manager config
mta receive maximum-recipients 0

```

```
!  
controller T1 1/0  
  framing esf  
  linecode b8zs  
  cablelength short 133  
  pri-group timeslots 1-24 service mgcp  
!  
controller T1 1/1  
  framing esf  
  clock source internal  
  linecode b8zs  
  pri-group timeslots 1-24 service mgcp  
!  
interface FastEthernet0/0  
  ip address 10.0.0.0 192.168.0.0  
  speed 100  
  full-duplex  
!  
interface FastEthernet0/1  
  no ip address  
  shutdown  
  duplex auto  
  speed auto  
!  
interface Serial1/0:23  
  no ip address  
  no logging event link-status  
  isdn switch-type primary-ni  
  isdn incoming-voice voice  
  isdn bind-13 ccm-manager  
  no cdp enable  
!  
interface Serial1/1:23  
  no ip address  
  no logging event link-status  
  isdn switch-type primary-ni  
  isdn protocol-emulate network  
  isdn incoming-voice voice  
  isdn bind-13 ccm-manager  
  no cdp enable  
!  
no ip http server  
ip classless  
ip route 0.0.0.0 0.0.0.0 10.0.0.0  
!  
snmp-server community private RW  
snmp-server community public RO  
snmp-server enable traps tty
```

```
snmp-server host 10.0.0.0 version 2c private
!
call rsvp-sync
!
voice-port 1/0:23
!
voice-port 1/1:23
!
mgcp
mgcp call-agent 110.0.0.0 2427 service-type mgcp version 0.1
mgcp dtmf-relay voip codec all mode out-of-band
mgcp rtp unreachable timeout 1000 action notify
mgcp modem passthrough voip mode nse
mgcp package-capability rtp-package
mgcp package-capability sst-package
no mgcp timer receive-rtcp
mgcp sdp simple
mgcp fax t38 inhibit
mgcp rtp payload-type g726r16 static
!
mgcp profile default
!
dial-peer cor custom
!
line con 0
line aux 0
line vty 0 4
  login
!
ntp clock-period 17180383
ntp server 10.0.0.0
end
```

Fax Relay Configuration

The following sections show configuration files for H.323 and MGCP gateway devices in fax relay mode:

- [H.323 Fax Relay Configuration, page 8-11](#)
- [MGCP Fax Relay Configuration, page 8-16](#)

H.323 Fax Relay Configuration

This section shows an H.323 fax relay configuration file.

The following commands must be configured for the H.323 gateway:

- `no modem passthrough nse codec g711ulaw`
- `no fax protocol pass-through g711 ulaw`

Cisco also recommends that you add the `fax rate` command to limit the bandwidth.

```
version 12.2
service nagle
no service pad
service timestamps debug datetime msec localtime
service timestamps log datetime msec localtime
no service password-encryption
!
hostname ap2-3745-h
!
logging queue-limit 100
logging buffered 1000000 debugging
no logging console
!
clock timezone SG 8
voice-card 1
  no dspfarm
!
ip subnet-zero
!
no ip domain lookup
ip domain name lab.com
!
isdn switch-type primary-net5
!
voice call carrier capacity active
!
voice service voip
!
voice class codec 1
  codec preference 1 g711alaw
  codec preference 2 g711ulaw
  codec preference 3 g729r8
!
voice class h323 1
  h225 timeout tcp establish 5
```

```

!
no voice hpi capture buffer
no voice hpi capture destination
!
mta receive maximum-recipients 0
!
controller E1 1/0
framing NO-CRC4
pri-group timeslots 1-31
!
controller E1 1/1
framing NO-CRC4
pri-group timeslots 1-31
!
interface FastEthernet0/0
ip address 10.0.0.0 192.168.0.0
speed 100
full-duplex
!
interface FastEthernet0/1
no ip address
shutdown
duplex auto
speed auto
!
interface Serial1/0:15
no ip address
no logging event link-status
isdn switch-type primary-net5
isdn incoming-voice voice
no cdp enable
!
interface Serial1/1:15
no ip address
no logging event link-status
isdn switch-type primary-net5
isdn protocol-emulate network
isdn incoming-voice voice
no isdn outgoing display-ie
no cdp enable
!
no ip http server
ip classless
ip route 0.0.0.0 0.0.0.0 10.0.0.0
!
snmp-server community private RW
snmp-server community public RO
snmp-server enable traps tty

```



```
snmp-server host 10.0.0.0 version 2c private
!
call rsvp-sync
!
voice-port 1/0:15
!
voice-port 1/1:15
!
voice-port 3/0/0
!
voice-port 3/0/1
!
voice-port 3/1/0
!
voice-port 3/1/1
  no battery-reversal
!
mgcp profile default
!
dial-peer cor custom
!
dial-peer voice 1 pots
  description incoming POTS
  incoming called-number .T
  direct-inward-dial
  forward-digits all
!
dial-peer voice 2 voip
  description outgoing VOIP to secondary CCM ap2-pub
  preference 10
  destination-pattern 2.....
  progress_ind setup enable 3
  no modem passthrough
  voice-class codec 1
  voice-class h323 1
  session target ipv4:10.0.0.0
  fax rate 14400
!
dial-peer voice 3 voip
  description outgoing VOIP to primary CCM ap2-cml
  preference 5
  destination-pattern 2.....
  progress_ind setup enable 3
  no modem passthrough
  voice-class codec 1
  voice-class h323 1
  session target ipv4:10.0.0.0
  fax rate 14400
```

```

!
dial-peer voice 98 pots
  description Outgoing POTS to DCOSS
  destination-pattern 98.....
  port 1/1:15
  forward-digits all
!
dial-peer voice 99 pots
  description Outgoing POTS to PSTN
  destination-pattern 99.....
  port 1/0:15
  forward-digits all
!
dial-peer voice 26 pots
  description Outgoing POTS to other gateway (via PSTN)
  destination-pattern [2-6].....
  port 1/0:15
!
dial-peer voice 20500200 pots
  description FXS Port
  destination-pattern 20500200
  port 3/1/0
!
dial-peer voice 20500201 pots
  description FXS Port
  destination-pattern 20500201
  port 3/1/1
!
dial-peer voice 71 voip
  description outgoing VOIP to secondary CCM ap2-pub
  preference 10
  destination-pattern 7.....
  progress_ind setup enable 3
  no modem passthrough
  voice-class codec 1
  voice-class h323 1
  session target ipv4:10.0.0.0
  fax rate 14400
!
dial-peer voice 72 voip
  description outgoing VOIP to primary CCM ap2-cm1
  preference 5
  destination-pattern 7.....
  progress_ind setup enable 3
  no modem passthrough
  voice-class codec 1
  voice-class h323 1
  session target ipv4:10.0.0.0

```

```
    fax rate 14400
!
dial-peer voice 81 voip
  description outgoing VOIP to secondary CCM ap2-pub
  preference 10
  destination-pattern 8.....
  progress_ind setup enable 3
  no modem passthrough
  voice-class codec 1
  voice-class h323 1
  session target ipv4:10.0.0.0
  fax rate 14400
!
dial-peer voice 82 voip
  description outgoing VOIP to primary CCM ap2-cm1
  preference 5
  destination-pattern 8.....
  progress_ind setup enable 3
  no modem passthrough
  voice-class codec 1
  voice-class h323 1
  session target ipv4:10.0.0.0
  fax rate 14400
!
dial-peer voice 91 voip
  description outgoing VOIP to secondary CCM ap2-pub
  preference 10
  destination-pattern 9.....
  progress_ind setup enable 3
  no modem passthrough
  voice-class codec 1
  voice-class h323 1
  session target ipv4:10.0.0.0
  fax rate 14400
!
dial-peer voice 92 voip
  description outgoing VOIP to primary CCM ap2-cm1
  preference 5
  destination-pattern 9.....
  progress_ind setup enable 3
  no modem passthrough
  voice-class codec 1
  voice-class h323 1
  session target ipv4:10.0.0.0
  fax rate 14400
!
dial-peer voice 100 voip
  incoming called-number T
```

```

no modem passthrough
voice-class codec 1
voice-class h323 1
fax rate 14400
!
dial-peer voice 20500210 pots
description FXS port
destination-pattern 20500210
port 3/0/0
!
dial-peer voice 20500211 pots
description FXS port
destination-pattern 20500211
port 3/0/1
!
dial-peer voice 90 pots
description Outgoing Modem to PSTN
destination-pattern 90.....
port 1/0:15
forward-digits all
!
line con 0
line aux 0
line vty 0 4
exec-timeout 0 0
login
!
ntp clock-period 17174990
ntp server 10.0.0.0
end

```

MGCP Fax Relay Configuration

This section shows an MGCP fax relay configuration file.

The following command must be configured for the MGCP gateway:

```
ccm-manager fax protocol cisco
```



Note

This command may not appear in the running config output from the show run command. To verify the fax mode is Cisco Fax Relay, enter **show ccm** on the MGCP gateway. The output will show `FAX mode: cisco` for fax relay mode.

```
version 12.2
service nagle
no service pad
service timestamps debug datetime msec localtime
service timestamps log datetime msec localtime
no service password-encryption
!
hostname ap2-3640-m
!
logging queue-limit 100
logging buffered 4000000 debugging
!
clock timezone SG 8
voice-card 1
!
ip subnet-zero
ip tcp synwait-time 13
!
no ip domain lookup
ip domain name lab.com
!
isdn switch-type primary-net5
!
voice call carrier capacity active
!
voice class codec 1
  codec preference 1 g711alaw
  codec preference 2 g711ulaw
  codec preference 3 g729r8
!
no voice hpi capture buffer
no voice hpi capture destination
!
mta receive maximum-recipients 0
ccm-manager redundant-host 10.0.0.0
ccm-manager mgcp
ccm-manager music-on-hold
ccm-manager config server 10.0.0.0
ccm-manager config
!
controller E1 1/0
  framing NO-CRC4
  pri-group timeslots 1-31 service mgcp
!
controller E1 1/1
  framing NO-CRC4
  pri-group timeslots 1-31 service mgcp
!
```

```

interface FastEthernet0/0
 ip address 10.0.0.0 192.168.0.0
 speed 100
 full-duplex
 !
interface FastEthernet0/1
 no ip address
 shutdown
 duplex auto
 speed auto
 !
interface Serial1/0:15
 no ip address
 no logging event link-status
 isdn switch-type primary-net5
 isdn incoming-voice voice
 isdn bind-13 ccm-manager
 no cdp enable
 !
interface Serial1/1:15
 no ip address
 no logging event link-status
 isdn switch-type primary-net5
 isdn protocol-emulate network
 isdn incoming-voice voice
 isdn bind-13 ccm-manager
 no cdp enable
 !
no ip http server
 ip classless
 ip route 0.0.0.0 0.0.0.0 10.0.0.0
 !
snmp-server community private RW
snmp-server community public RO
snmp-server enable traps tty
snmp-server host 10.0.0.0 version 2c private
call rsvp-sync
 !
voice-port 1/0:15
 cptone SG
 !
voice-port 1/1:15
 cptone SG
 !
voice-port 2/0/0
 cptone SG
 !
voice-port 2/0/1

```

```
    cptone SG
  !
voice-port 2/1/0
  cptone SG
  !
voice-port 2/1/1
  cptone SG
  !
mgcp
mgcp call-agent 10.0.0.0 2427 service-type mgcp version 0.1
mgcp dtmf-relay voip codec all mode out-of-band
mgcp rtp unreachable timeout 1000 action notify
mgcp package-capability rtp-package
mgcp package-capability sst-package
no mgcp timer receive-rtcp
mgcp sdp simple
mgcp fax t38 inhibit
mgcp rtp payload-type g726r16 static
  !
mgcp profile default
  !
dial-peer cor custom
  !
dial-peer voice 999200 pots
  application mgcpapp
  port 2/0/0
  !
dial-peer voice 999201 pots
  application mgcpapp
  port 2/0/1
  !
dial-peer voice 999210 pots
  application mgcpapp
  port 2/1/0
  !
dial-peer voice 999211 pots
  application mgcpapp
  port 2/1/1
  !
line con 0
line aux 0
line vty 0 4
  exec-timeout 67 6
  login
  !
ntp clock-period 17179708
ntp server 10.0.0.0
end
```




Quality of Service Configuration

This chapter provides provides sample configuration files that show how Quality of Service (QoS) settings were configured on selected switches and WAN routers for IP Communications System Test Release 2.0 for IPT.

This chapter includes the following topics:

- [Cisco Catalyst 6506 Switch Configuration, page 9-1](#)
- [Cisco 3725 Router Configuration, page 9-8](#)
- [Cisco 7206 Router Configuration, page 9-15](#)

Cisco Catalyst 6506 Switch Configuration

This section shows a configuration file for the Cisco Catalyst 6506 8.1(1) switch that was used in the QoS testing.

For additional installation and configuration information, refer to the Cisco Catalyst 6500 series documentation at this URL:

<http://www.cisco.com/univercd/cc/td/doc/product/lan/cat6000/index.htm>

```
#dot1x
set dot1x system-auth-control disable
set dot1x shutdown-timeout 0
set feature dot1x-radius-keepalive disable
!
#system
set system name ap1-6509
set system location Lab
```

```
set system contact IPT@cisco.com
set system highavailability enable
set system highavailability versioning enable
set system core-dump enable
!
#Default Inlinepower
set inlinepower defaultallocation 7000
!
#stp mode
set spanntree mode pvst+
!
#vtp
set vtp domain lab
set vtp mode transparent vlan
set vtp version 2
set vlan 102 name Gatekeepers type ethernet mtu 1500 said 100102 state
active
set vlan 103 name CallManagers type ethernet mtu 1500 said 100103
state active
set vlan 104 name Digital_Gateways type ethernet mtu 1500 said 100104
state active
set vlan 105 name Analog_Gateways type ethernet mtu 1500 said 100105
state active
set vlan 106 name Server_Farm type ethernet mtu 1500 said 100106 state
active
set vlan 107 name Tools type ethernet mtu 1500 said 100107 state
active
set vlan 113 name Lab_Backbone type ethernet mtu 1500 said 100113
state active
set vlan 610 name Data1 type ethernet mtu 1500 said 100610 state
active
set vlan 611 name Voice1 type ethernet mtu 1500 said 100611 state
active
set vlan 710 name Data2 type ethernet mtu 1500 said 100710 state
active
set vlan 711 name Voice2 type ethernet mtu 1500 said 100711 state
active
set vlan 810 name Data3 type ethernet mtu 1500 said 100810 state
active
set vlan 811 name Voice3 type ethernet mtu 1500 said 100811 state
active
set vlan 910 name Data4 type ethernet mtu 1500 said 100910 state
active
set vlan 911 name Voice4 type ethernet mtu 1500 said 100911 state
active
set vlan 1002 name fddi-default type fddi mtu 1500 said 101002 state
active
```

```
set vlan 1004 name fddinet-default type fddinet mtu 1500 said 101004
state active bridge 0x0 stp ieee
set vlan 1005 name trbrf-default type trbrf mtu 4472 said 101005 state
active bridge 0xf stp ibm
set vlan 1,888,999
set vlan 1025 name
set vlan 1026 name
set vlan 1027 name
set vlan 1028 name
set vlan 1029 name
set vlan 1003 name trcrf-default type trcrf mtu 4472 said 101003 state
active parent 1005 ring 0xcc mode srb aremaxhop 7 stemaxhop 7
backupcrf off
!
set interface sc0 113 10.0.0.0/255.255.255.192 10.0.0.1
set interface sc1 0 0.0.0.0/0.0.0.0 0.0.0.0
set interface sc1 down
set ip route 0.0.0.0/0.0.0.0 10.0.0.2
set ip alias default 0.0.0.0
!
#ntp
set ntp client enable
set timezone SG 8 0
!
#set boot command
set boot config-register 0x102
set boot config-register auto-config sync enable
set boot system flash bootflash:cat6000-sup2cvk8.8-1-1.bin
set boot system flash bootflash:cat6000-sup2cvk8.7-6-2.bin
!
#mls
set mls agingtime long-duration 1920
set mls agingtime 256
set mls agingtime ipx 256
!
#qos
set qos enable
set qos map 2q2t tx 2 1 cos 1
set qos map 2q2t tx 2 1 cos 2
set qos map 2q2t tx 2 1 cos 3
set qos map 2q2t tx 2 2 cos 5
set qos drop-threshold 2q2t tx queue 1 100 100
set qos map 1p1q4t rx 1 3 cos 1
set qos map 1p1q4t rx 1 3 cos 2
set qos map 1p1q4t rx 1 3 cos 3
set qos map 1p1q4t rx 1 4 cos 6
set qos map 1p2q2t tx 2 1 cos 1
set qos map 1p2q2t tx 2 1 cos 2
```

```
set qos map lp2q2t tx 2 1 cos 3
set qos map lp2q2t tx 2 2 cos 6
set qos wrr lp2q2t 50 255
set qos wred lp2q2t tx queue 1 70:100 70:100
set qos wred lp2q2t tx queue 2 70:90 100:100
set qos map lp3q1t tx 2 1 cos 1
set qos map lp3q1t tx 3 1 cos 3
set qos map lp3q1t tx 3 1 cos 4
set qos map lp3q1t tx 3 cos 6
set qos map lp3q1t tx 3 cos 7
set qos wrr lp3q1t 20 100 200
set qos wred lp3q1t tx queue 3 70:90
set qos map lp1q0t rx 2 cos 6
set qos map lp1q0t rx 2 cos 7
set qos map lp2q1t tx 2 1 cos 1
set qos map lp2q1t tx 2 1 cos 2
set qos map lp2q1t tx 2 1 cos 3
set qos map lp2q1t tx 2 cos 6
set qos map lp2q1t tx 2 cos 7
set qos wrr lp2q1t 50 255
set qos txq-ratio lp2q1t 70 15 15
set qos wred lp2q1t tx queue 2 70:90
set qos cos-dscp-map 0 10 18 26 34 46 48 56
set qos ipprec-dscp-map 0 10 18 26 34 46 48 56
set qos policed-dscp-map 0,24,46:0
set qos policed-dscp-map 1:1
set qos policed-dscp-map 2:2
set qos policed-dscp-map 3:3
set qos policed-dscp-map 4:4
set qos policed-dscp-map 5:5
set qos policed-dscp-map 6:6
set qos policed-dscp-map 7:7
set qos policed-dscp-map 8:8
set qos policed-dscp-map 9:9
set qos policed-dscp-map 10:10
set qos policed-dscp-map 11:11
set qos policed-dscp-map 12:12
set qos policed-dscp-map 13:13
set qos policed-dscp-map 14:14
set qos policed-dscp-map 15:15
set qos policed-dscp-map 16:16
set qos policed-dscp-map 17:17
set qos policed-dscp-map 18:18
set qos policed-dscp-map 19:19
set qos policed-dscp-map 20:20
set qos policed-dscp-map 21:21
set qos policed-dscp-map 22:22
set qos policed-dscp-map 23:23
```

```
set qos policed-dscp-map 25:25
set qos policed-dscp-map 26:26
set qos policed-dscp-map 27:27
set qos policed-dscp-map 28:28
set qos policed-dscp-map 29:29
set qos policed-dscp-map 30:30
set qos policed-dscp-map 31:31
set qos policed-dscp-map 32:32
set qos policed-dscp-map 33:33
set qos policed-dscp-map 34:34
set qos policed-dscp-map 35:35
set qos policed-dscp-map 36:36
set qos policed-dscp-map 37:37
set qos policed-dscp-map 38:38
set qos policed-dscp-map 39:39
set qos policed-dscp-map 40:40
set qos policed-dscp-map 41:41
set qos policed-dscp-map 42:42
set qos policed-dscp-map 43:43
set qos policed-dscp-map 44:44
set qos policed-dscp-map 45:45
set qos policed-dscp-map 47:47
set qos policed-dscp-map 48:48
set qos policed-dscp-map 49:49
set qos policed-dscp-map 50:50
set qos policed-dscp-map 51:51
set qos policed-dscp-map 52:52
set qos policed-dscp-map 53:53
set qos policed-dscp-map 54:54
set qos policed-dscp-map 55:55
set qos policed-dscp-map 56:56
set qos policed-dscp-map 57:57
set qos policed-dscp-map 58:58
set qos policed-dscp-map 59:59
set qos policed-dscp-map 60:60
set qos policed-dscp-map 61:61
set qos policed-dscp-map 62:62
set qos policed-dscp-map 63:63
clear qos acl all
#ACL_TRUST-COS
set qos acl ip ACL_TRUST-COS trust-cos ip any any
#ACL_TRUST-DSCP
set qos acl ip ACL_TRUST-DSCP trust-dscp ip any any
#ACL_TRUST-IPPREC
set qos acl ip ACL_TRUST-IPPREC trust-ipprec ip any any
#ACL_VOIP-ALL
set qos acl ip ACL_VOIP-ALL dscp 46 udp any any range 16384 32767
set qos acl ip ACL_VOIP-ALL dscp 26 tcp any any range 2000 2002
```

```

set qos acl ip ACL_VOIP-ALL dscp 26 tcp any any eq 1720
set qos acl ip ACL_VOIP-ALL dscp 26 tcp any any range 11000 11999
set qos acl ip ACL_VOIP-ALL dscp 26 udp any any eq 2427
#ACL_IP-TRUSTDSCP
set qos acl ip ACL_IP-TRUSTDSCP trust-dscp ip any any
#
commit qos acl all
set qos acl map ACL_TRUST-COS 810,910
!
#port channel
set port channel 3/28 586
set port channel 3/25-27 592
!
#qos statistics data export
set qos statistics export enable
!
# default port status is enable
!
#module 1 : 2-port 1000BaseX Supervisor
set vlan 113 1/1
set port name 1/1 6509_1 3/6
set port dot1x 1/1 guest-vlan 0
!
#module 2 : 2-port 1000BaseX Supervisor
set port dot1x 2/1 guest-vlan 0
!
#module 3 : 48-port 10/100BaseTX Ethernet
set vlan 102 3/2
set vlan 103 3/3-4
set vlan 104 3/5-13,3/21,3/29
set vlan 105 3/14-15
set vlan 106 3/16
set vlan 107 3/17-20,3/23-25
set vlan 113 3/37
set vlan 610 3/39-40
set vlan 710 3/41-42
set vlan 810 3/43-44
set vlan 910 3/27-28,3/45-46
set vlan 999 3/30
set port auxiliaryvlan 3/39 611
set port auxiliaryvlan 3/40 611
set port auxiliaryvlan 3/41 711
set port auxiliaryvlan 3/42 711
set port auxiliaryvlan 3/43 811
set port auxiliaryvlan 3/44 811
set port auxiliaryvlan 3/45 911
set port auxiliaryvlan 3/46 911
set port qos 3/15 trust-ext trust-cos

```

```
set port speed
3/2-3,3/5-13,3/15-16,3/18-19,3/25,3/27-28,3/39,3/45 100
set port duplex 3/2-3,3/5-13,3/15-16,3/18-19,3/25,3/27-28 full
set port name 3/2 ap1-gk
set port name 3/3 ap1-pub
set port name 3/4 ap1-cml
set port name 3/5 ap1-1760-m
set port name 3/6 ap1-2611-h
set port name 3/7 ap1-2621-m
set port name 3/8 ap1-2651-h
set port name 3/9 ap1-2691-m
set port name 3/10 ap1-3640-h
set port name 3/11 ap1-3662-m
set port name 3/12 ap1-3725-h
set port name 3/13 ap1-1760-h
set port name 3/14 ap1-ata186
set port name 3/15 ap1-ata188
set port name 3/16 ap1-dcl
set port name 3/17 ap-ciscoworks
set port name 3/18 ap-fr-switch2
set port name 3/19 ap-fr-switch1
set port name 3/20 ap-pstn1
set port name 3/23 ap-snooper1-qfe3
set port name 3/24 ixia-4-4
set port name 3/25 ap-irec1-eth1
set port name 3/27 Ixia port 5/1
set port name 3/29 PAGENT-fe0/1
set trunk 3/28 off negotiate 1-1005,1025-4094
set trunk 3/39 auto negotiate 1-1005,1025-4094
set trunk 3/41 auto negotiate 1-1005,1025-4094
set trunk 3/43 auto negotiate 1-1005,1025-4094
set trunk 3/45 auto negotiate 1-1005,1025-4094
set spanntree portfast 3/28 enable
set port qos 3/6,3/11 cos 5
set port qos 3/39-46 trust trust-cos
set port qos 3/43-46 vlan-based
set qos acl map ACL_TRUST-COS 3/15,3/39-42
set qos acl map ACL_TRUST-DSCP 3/2-12,3/27-28
set qos acl map ACL_TRUST-IPPREC 3/29
set port qos 3/1-48 policy-source local
set port channel 3/27-28 mode off
!
#module 4 : 8-port E1
set port voice interface 4/1 dhcp enable vlan 104
set port voice interface 4/2 dhcp enable vlan 104
set port voice interface 4/3 dhcp enable vlan 104
set port voice interface 4/4 dhcp enable vlan 104
set port voice interface 4/5 dhcp enable vlan 104
```

```

set port voice interface 4/6 dhcp enable vlan 104
set port voice interface 4/7 dhcp enable vlan 104
set port voice interface 4/8 dhcp enable vlan 104
!
#module 5 : 8-port T1
set port voice interface 5/1 dhcp enable vlan 104
set port voice interface 5/2 dhcp enable vlan 104
set port voice interface 5/3 dhcp enable vlan 104
set port voice interface 5/4 dhcp enable vlan 104
set port voice interface 5/5 dhcp enable vlan 104
set port voice interface 5/6 dhcp enable vlan 104
set port voice interface 5/7 dhcp enable vlan 104
set port voice interface 5/8 dhcp disable 10.0.0.2 255.255.255.192
vlan 104
  tftp 10.0.0.3 gateway 10.0.0.4 dns 10.0.0.5 lab.com
!
#module 6 : 5-port Communication Media Mod.
set vlan 104 6/1
!
#module 7 : 5-port Communication Media Mod.
set vlan 104 7/1
!
#module 8 : 24-port FXS
set port voice interface 8/1-24 dhcp enable vlan 105
!
#module 9 : 0-port FlexWAN Module
!
#module 15 : 1-port Multilayer Switch Feature Card
!
#module 16 empty
end

```

Cisco 3725 Router Configuration

This section shows a serial interface configuration for the Cisco 3725 router that was used in the QoS testing. This router runs Cisco IOS Software Release 12.2(15)T9.

For additional installation and configuration information, refer to the Cisco 3725 router documentation at this URL:

http://www.cisco.com/univercd/cc/td/doc/product/access/acs_mod/cis3700

```

version 12.2
service nagle

```



```
no service pad
service timestamps debug datetime msec localtime
service timestamps log datetime msec localtime
no service password-encryption
!
hostname ap3-1-3725-hda-m
!
logging queue-limit 100
logging buffered 20000000 debugging
enable password Lab
!
clock timezone SG 8
voice-card 1
  no dspfarm
!
ip subnet-zero
ip tcp synwait-time 13
!
!
ip cef
no ip domain lookup
ip domain name lab.com
!
voice class codec 1
  codec preference 1 g711alaw
  codec preference 2 g711ulaw
  codec preference 3 g729r8
!
no voice hpi capture buffer
no voice hpi capture destination
!
ccm-manager redundant-host 10.0.0.1
ccm-manager mgcp
ccm-manager music-on-hold
ccm-manager config server 10.0.0.1
ccm-manager config
mta receive maximum-recipients 0
!
controller E1 0/0
  framing NO-CRC4
  channel-group 0 timeslots 1-12
!
controller E1 0/1
  framing NO-CRC4
!
class-map match-all WAN-VOICE
  match ip dscp ef
class-map match-all PRIORITY-DATA
```

```

    description ftp http tftp etc
    match access-group name PRIORITY-DATA
    class-map match-all WAN-VOICE-CONTROL
    match ip dscp af31
!
policy-map WAN-EDGE-LFI
  class WAN-VOICE
    priority 84
  class WAN-VOICE-CONTROL
    bandwidth percent 5
  class PRIORITY-DATA
    bandwidth percent 15
  class class-default
    fair-queue
policy-map WAN-EDGE-1PCT-LLQ
  class WAN-VOICE
    priority percent 1
  class WAN-VOICE-CONTROL
    bandwidth percent 2
  class PRIORITY-DATA
    bandwidth percent 20
  class class-default
    fair-queue
policy-map WAN-EDGE
  description %35 for 252 Kbps = 3 G711 calls
  class WAN-VOICE
    priority percent 35
  class WAN-VOICE-CONTROL
    bandwidth percent 2
  class PRIORITY-DATA
    bandwidth percent 20
  class class-default
    fair-queue
!
interface Loopback0
  ip address 10.0.0.2 255.255.255.255
  h323-gateway voip bind srcaddr 10.0.0.2
!
interface FastEthernet0/0
  no ip address
  speed 100
  full-duplex
!
interface FastEthernet0/0.630
  encapsulation dot1Q 630
  ip address 10.0.0.3 255.255.255.240
  ip helper-address 10.0.0.4
  no cdp enable

```

```
!  
interface FastEthernet0/0.631  
  encapsulation dot1Q 631  
  ip address 10.0.0.5 255.255.255.240  
  ip helper-address 10.0.0.4  
  no cdp enable  
!  
interface FastEthernet0/0.730  
  encapsulation dot1Q 730  
  ip address 10.0.0.6 255.255.255.240  
  ip helper-address 10.0.0.4  
  no cdp enable  
!  
interface FastEthernet0/0.731  
  encapsulation dot1Q 731  
  ip address 10.0.0.7 255.255.255.240  
  ip helper-address 10.0.0.4  
  no cdp enable  
!  
interface FastEthernet0/0.830  
  encapsulation dot1Q 830  
  ip address 10.0.0.8 255.255.255.240  
  ip helper-address 10.0.0.4  
  no cdp enable  
!  
interface FastEthernet0/0.831  
  encapsulation dot1Q 831  
  ip address 10.0.0.9 255.255.255.240  
  ip helper-address 10.0.0.4  
  no cdp enable  
!  
interface FastEthernet0/0.930  
  encapsulation dot1Q 930  
  ip address 10.0.0.10 255.255.255.240  
  ip helper-address 10.0.0.4  
  no cdp enable  
!  
interface FastEthernet0/0.931  
  encapsulation dot1Q 931  
  ip address 10.0.0.11 255.255.255.240  
  ip helper-address 10.0.0.4  
  no cdp enable  
!  
interface Serial0/0:0  
  bandwidth 768  
  ip address 10.0.0.12 255.255.255.252  
  encapsulation frame-relay  
  ip ospf network point-to-point
```

```

ip ospf dead-interval 65000
load-interval 30
cdp enable
frame-relay class FRTS-720k
frame-relay traffic-shaping
frame-relay interface-dlci 503
frame-relay ip rtp header-compression
frame-relay ip rtp compression-connections 3
!
interface FastEthernet0/1
no ip address
shutdown
duplex auto
speed auto
!
router ospf 3
router-id 10.0.0.2
log-adjacency-changes
network 10.0.0.13 0.0.255.255 area 113
!
no ip http server
ip classless
!
ip access-list extended PRIORITY-DATA
permit tcp any eq www any
permit tcp any any eq www
permit tcp any range ftp-data telnet any
permit tcp any any range ftp-data telnet
permit udp any any eq tftp
permit udp any eq tftp any
permit tcp any range 135 139 any
permit tcp any any range 135 139
permit udp any any range 135 netbios-ss
!
map-class frame-relay FRTS-128k
frame-relay cir 124872
frame-relay bc 1250
frame-relay be 0
frame-relay mincir 124872
service-policy output WAN-EDGE-LFI
!
map-class frame-relay FRTS-1896k
frame-relay cir 1896000
frame-relay bc 18960
frame-relay be 0
frame-relay mincir 1896000
service-policy output WAN-EDGE
!

```

```
map-class frame-relay FRTS-112k
  frame-relay cir 109264
  frame-relay bc 1092
  frame-relay be 0
  frame-relay mincir 109264
  service-policy output WAN-EDGE-LFI
!
map-class frame-relay FRTS-720k
  frame-relay fragment 960
  frame-relay cir 720000
  frame-relay bc 7200
  frame-relay be 0
  frame-relay mincir 720000
  service-policy output WAN-EDGE
!
map-class frame-relay one-percent
  frame-relay cir 100000
  frame-relay bc 1000
  frame-relay be 0
  frame-relay mincir 100000
  service-policy output WAN-EDGE-1PCT-LLQ
!
snmp-server community private RW
snmp-server community public RO
snmp-server enable traps tty
snmp-server host 10.0.0.14 version 2c private
!
call rsvp-sync
!
voice-port 1/0/0
  no battery-reversal
!
voice-port 1/0/1
!
voice-port 1/0/2
!
voice-port 1/0/3
!
voice-port 1/0/4
!
voice-port 1/0/5
!
voice-port 1/0/6
!
voice-port 1/0/7
!
voice-port 1/0/8
!
```

```
voice-port 1/0/9
!
voice-port 1/0/10
!
voice-port 1/0/11
!
mgcp
mgcp call-agent 10.0.0.15 2427 service-type mgcp version 0.1
mgcp dtmf-relay voip codec all mode out-of-band
mgcp rtp unreachable timeout 1000 action notify
mgcp package-capability rtp-package
mgcp package-capability sst-package
no mgcp timer receive-rtcp
mgcp sdp simple
mgcp fax t38 inhibit
mgcp rtp payload-type g726r16 static
!
mgcp profile default
!
dial-peer cor custom
!
dial-peer voice 999100 pots
  application mgcpapp
  port 1/0/0
!
dial-peer voice 999101 pots
  application mgcpapp
  port 1/0/1
!
dial-peer voice 999102 pots
  application mgcpapp
  port 1/0/2
!
dial-peer voice 999103 pots
  application mgcpapp
  port 1/0/3
!
dial-peer voice 999104 pots
  application mgcpapp
  port 1/0/4
!
dial-peer voice 999105 pots
  application mgcpapp
  port 1/0/5
!
dial-peer voice 999106 pots
  application mgcpapp
  port 1/0/6
```

```
!  
dial-peer voice 999107 pots  
  application mgcpapp  
  port 1/0/7  
!  
dial-peer voice 999108 pots  
  application mgcpapp  
  port 1/0/8  
!  
dial-peer voice 999109 pots  
  application mgcpapp  
  port 1/0/9  
!  
dial-peer voice 9991010 pots  
  application mgcpapp  
  port 1/0/10  
!  
dial-peer voice 9991011 pots  
  application mgcpapp  
  port 1/0/11  
!  
line con 0  
  exec-timeout 30 30  
line aux 0  
line vty 0 4  
  exec-timeout 0 0  
  password Lab  
  login  
!  
ntp clock-period 17180586  
ntp server 10.0.0.16  
end
```

Cisco 7206 Router Configuration

This section shows an HSSI configuration for the Cisco 7206 router NPE400 that was used in the QoS testing. This router runs Cisco IOS Software Release 12.2(15)T9.

For additional installation and configuration information, refer to the Cisco 7206 router documentation at this URL:

<http://www.cisco.com/univercd/cc/td/doc/product/core/7206/index.htm>

```
version 12.2
no parser cache
service nagle
no service pad
service timestamps debug datetime msec localtime
service timestamps log datetime msec localtime
no service password-encryption
!
hostname ap2-7206
!
boot system disk0:c7200-is-mz.122-15.T8.bin
logging queue-limit 100
logging buffered 10000000 debugging
no logging console
enable password Lab
!
clock timezone SG 8
ip subnet-zero
!
ip cef
no ip domain lookup
ip domain name lab.com
!
no voice hpi capture buffer
no voice hpi capture destination
!
mta receive maximum-recipients 0
!
class-map match-any WAN-VOICE
  match ip dscp ef
  match ip dscp cs5
class-map match-all PRIORITY-DATA
  description ftp http tftp etc
  match access-group name PRIORITY-DATA
class-map match-all WAN-VOICE-CONTROL
  match ip dscp af31
!
policy-map WAN-EDGE-LFI
  class WAN-VOICE
    priority percent 50
  class WAN-VOICE-CONTROL
    bandwidth percent 5
  class PRIORITY-DATA
    bandwidth percent 20
  class class-default
    fair-queue
policy-map WAN-EDGE
  class WAN-VOICE
```



```
    priority percent 33
    class WAN-VOICE-CONTROL
      bandwidth percent 2
    class PRIORITY-DATA
      bandwidth percent 20
    class class-default
      fair-queue
!
interface Loopback0
  ip address 10.0.0.1 255.255.255.255
!
interface FastEthernet0/0
  description ap2-4506 2/1
  ip address 10.0.0.2 255.255.255.252
  duplex full
  speed 100
!
interface FastEthernet0/1
  no ip address
  shutdown
  duplex auto
  speed auto
!
interface Hss1/0
  mtu 1500
  bandwidth 12959
  no ip address
  encapsulation frame-relay
  load-interval 30
  hssi internal-clock
  serial restart_delay 0
  frame-relay traffic-shaping
  frame-relay ip rtp header-compression
!
interface Hss1/0.201 point-to-point
  description pvc to LAB AP1
  bandwidth 10368
  ip address 10.0.0.3 255.255.255.252
  frame-relay class FRTS-10368k
  frame-relay interface-dlci 201
  frame-relay ip rtp header-compression
  frame-relay ip rtp compression-connections 3
!
interface Hss1/0.206 point-to-point
  description pvc to LAB AP1-2
  bandwidth 512
  ip address 10.0.0.4 255.255.255.252
  ip ospf dead-interval 65000
```

```
frame-relay class FRTS-512k
frame-relay interface-dlci 206
frame-relay ip rtp header-compression
frame-relay ip rtp compression-connections 3
!
interface Hss1/1
no ip address
shutdown
serial restart_delay 0
!
router ospf 3
router-id 10.0.0.1
log-adjacency-changes
network 10.0.0.5 0.0.255.255 area 113
!
ip classless
no ip http server
!
ip access-list extended PRIORITY-DATA
permit tcp any eq www any
permit tcp any any eq www
permit tcp any range ftp-data telnet any
permit tcp any any range ftp-data telnet
permit udp any any eq tftp
permit udp any eq tftp any
permit tcp any range 135 139 any
permit tcp any any range 135 139
permit udp any any range 135 netbios-ss
!
map-class frame-relay FRTS-10368k
frame-relay cir 10368000
frame-relay bc 103680
frame-relay be 0
frame-relay mincir 10368000
service-policy output WAN-EDGE
!
map-class frame-relay FRTS-512k
frame-relay cir 508816
frame-relay bc 5090
frame-relay be 0
frame-relay mincir 508816
service-policy output WAN-EDGE
frame-relay fragment 640
!
map-class frame-relay FRTS-256k
frame-relay cir 252832
frame-relay bc 2530
frame-relay be 0
```

```
    frame-relay mincir 252832
    service-policy output WAN-EDGE-LFI
    frame-relay fragment 320
    !
map-class frame-relay FRTS-45000k
    frame-relay cir 45000000
    frame-relay bc 450000
    frame-relay be 0
    frame-relay mincir 45000000
    service-policy output WAN-EDGE
    !
map-class frame-relay FRTS-1896k
    frame-relay cir 1896000
    frame-relay bc 18960
    frame-relay be 0
    frame-relay mincir 1896000
    service-policy output WAN-EDGE
    !
map-class frame-relay FRTS-230k
    frame-relay cir 227548
    frame-relay bc 2275
    frame-relay be 0
    frame-relay mincir 227548
    service-policy output WAN-EDGE-LFI
    frame-relay fragment 320
    !
snmp-server community private RW
snmp-server community public RO
snmp-server enable traps tty
snmp-server host 10.0.0.6 version 2c private
    !
call rsvp-sync
    !
mgcp profile default
    !
dial-peer cor custom
    !
gatekeeper
    shutdown
    !
line con 0
    stopbits 1
line aux 0
    stopbits 1
line vty 0 4
    exec-timeout 0 0
    password Lab
    login
```

```
line vty 5 15
  exec-timeout 30 0
  password Lab
  login
!
ntp clock-period 17180615
ntp server 10.0.0.7
!
end
```



Call Flow

This chapter provides information about a typical call flow in an IPT environment.

[Figure 10-1](#) shows a call flow that involves the following devices and locations:

- Cisco IP Phone at a Very Large Site
- Cisco CallManager at Very Large Site
- Gatekeeper at a Very Large Site
- Cisco IP Phone at a Large Site
- Cisco CallManager at Large Site
- Gatekeeper at a Large Site

This call flow provides an overview of the actions involved in a typical call.

For related information and for additional call flow examples, refer to *Troubleshooting Cisco IP Telephony* (published by Cisco Press, ISBN 1-58705-075-7).

Figure 10-1 Call Flow in an IPT Environment

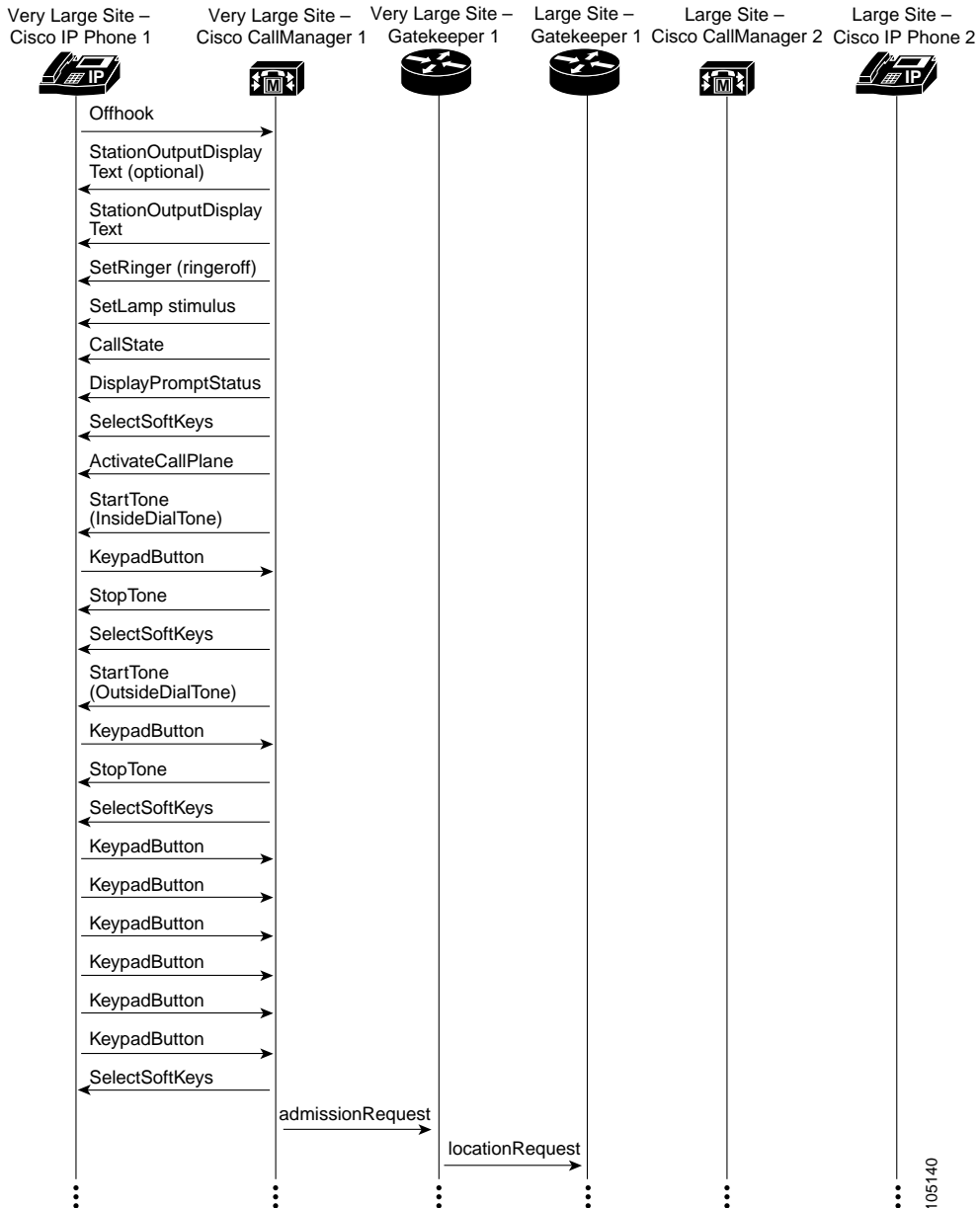
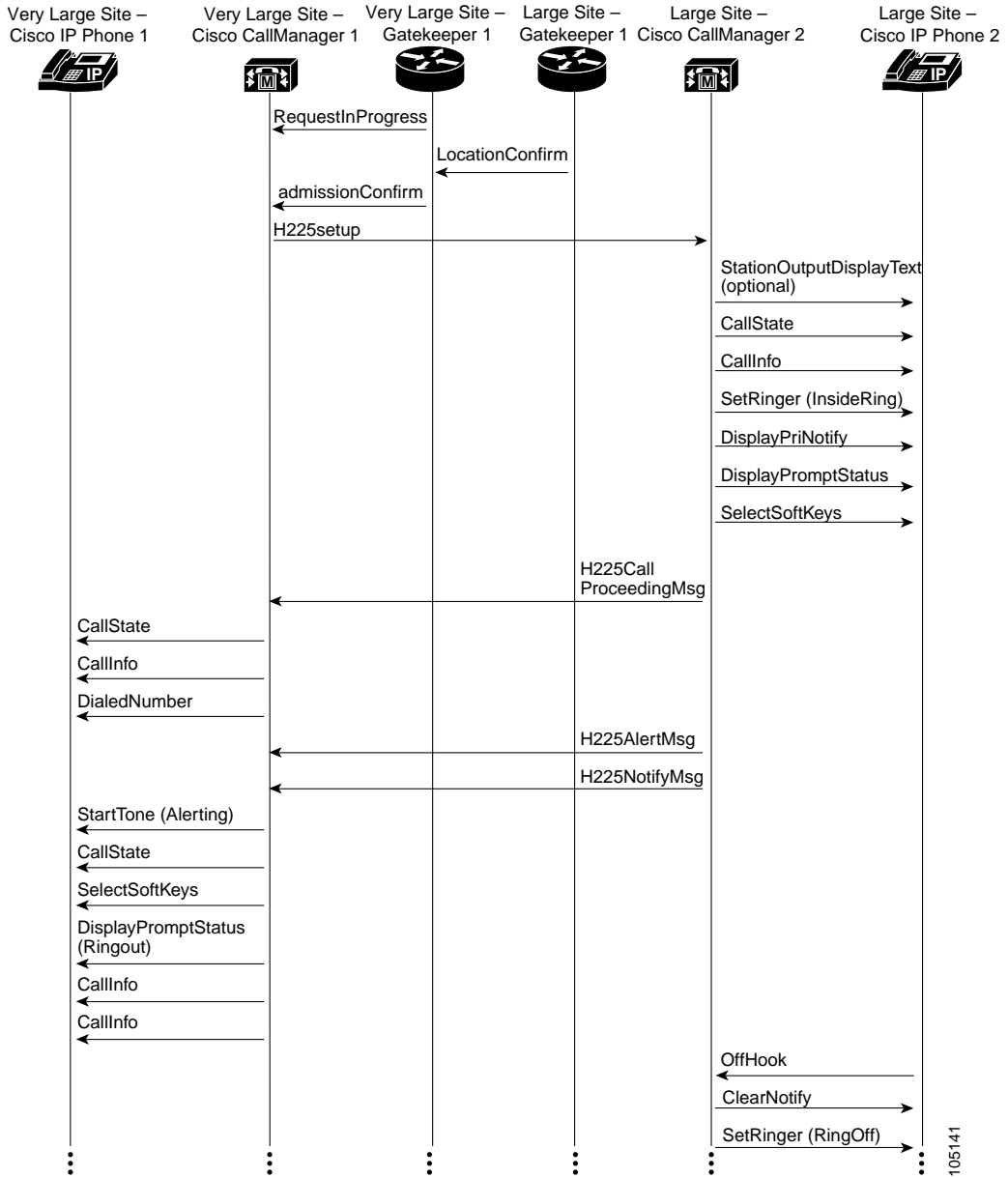
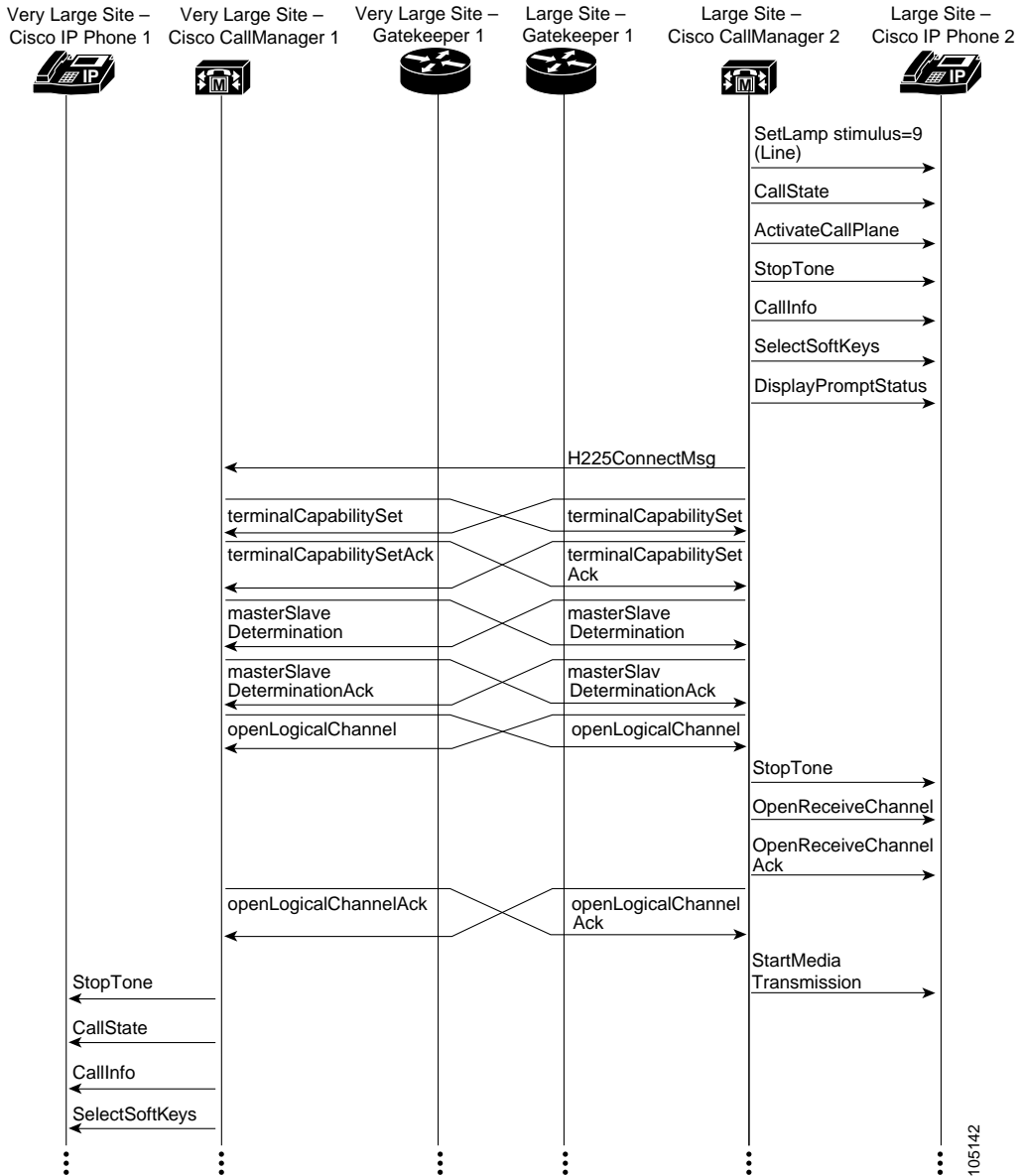


Figure 10-1 Call Flow in an IPT Environment (continued)



105141

Figure 10-1 Call Flow in an IPT Environment (continued)



105142

Figure 10-1 Call Flow in an IPT Environment (continued)

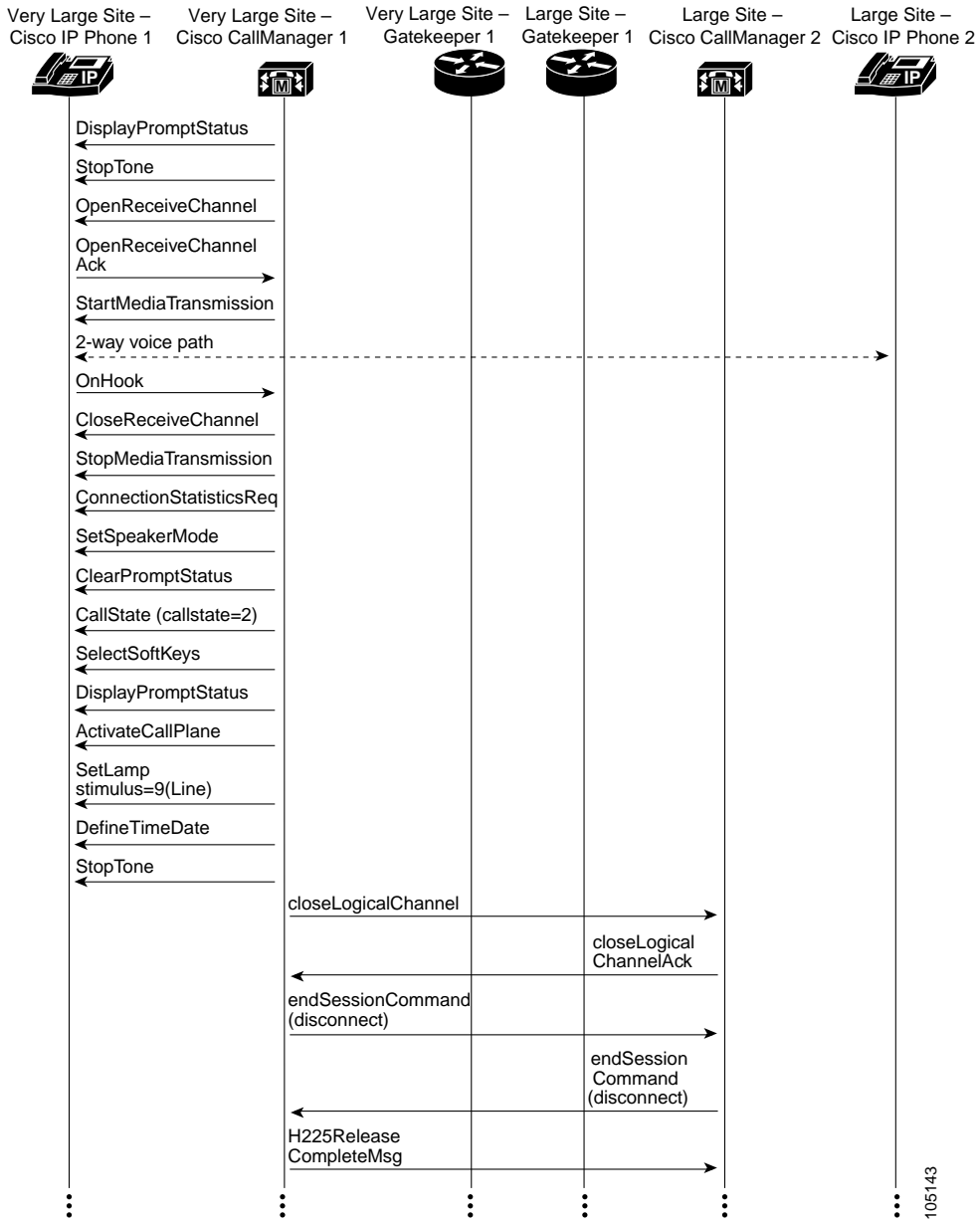
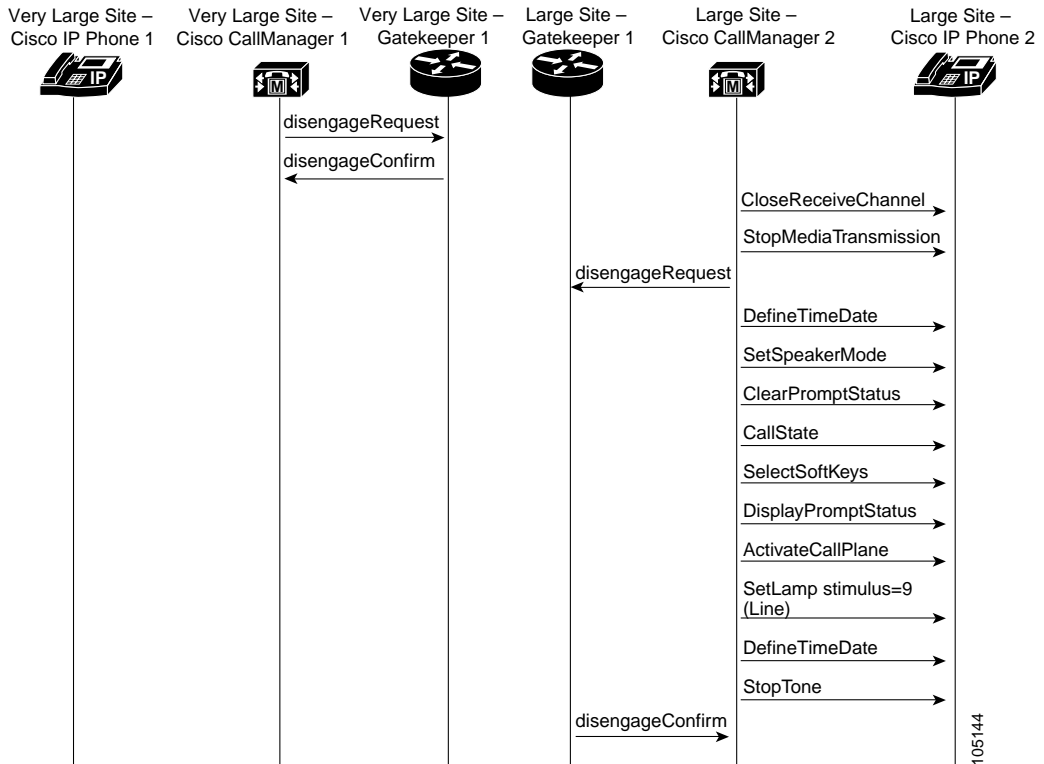


Figure 10-1 Call Flow in an IPT Environment (continued)





Troubleshooting

This chapter provides basic troubleshooting information and tips for IPT scenarios. It also provides references to other troubleshooting information.

This chapter includes the following topics:

- [Troubleshooting IPT Scenarios, page 11-1](#)
- [General Troubleshooting Tips, page 11-3](#)
- [Additional Troubleshooting Resources, page 11-4](#)

Troubleshooting IPT Scenarios

This section provides troubleshooting information for the following situations:

- [Intercluster Trunk Calls with Gatekeepers Fail, page 11-1](#)
- [Site-to-Site IP Calls Fail, page 11-2](#)

Intercluster Trunk Calls with Gatekeepers Fail

Symptom: When the Primary Cisco CallManager fails and there is a secondary Cisco CallManager configured in the device pool, intercluster trunk calls with gatekeepers do not work.

Workaround: Perform the following steps. This procedure will allow intercluster trunk calls to be made through the backup Cisco CallManager if the primary Cisco CallManager fails.

1. Create a Cisco CallManager group with only one Cisco CallManager. Name this group Standalone_CM1.
2. Create a device pool called Standalone_CM1 and associate the Standalone_CM1 Cisco CallManager group with this device pool.
3. Associate the Standalone_CM1 device pool with the intercluster trunk configuration.
4. Create another Cisco CallManager group with another Cisco CallManager. Name this group Standalone_CM2.
5. Create a device pool called Standalone_CM2 and associate the Standalone_CM2 Cisco CallManager group with this device pool.
6. Associate the Standalone_CM2 device pool with the intercluster trunk configuration.

Site-to-Site IP Calls Fail

Symptom: A call fails in the following situation:

- The call is made from a Cisco IP Phone in a site with a Cisco CallManager Cluster to another Cisco IP Phone in another site with a Cisco CallManager cluster
- The call is made through a gatekeeper controlled intercluster trunk

Workaround: Perform the following steps:

1. Verify that each originating and terminating IP Phone has the proper calling search space and partition to make and receive intercluster trunk calls.
2. Verify that the route group is configured with the intercluster trunks that are listed as route group members.
3. Verify that the route list has the proper route group associated with it.
4. Verify that the route pattern has the proper route list associated with it.
5. Verify that the Gatekeeper web page in Cisco CallManager Administration has the proper host name and IP address of the gatekeeper.

6. Verify that the intercluster trunk is registered with the gatekeeper by using the **show gatekeeper endpoints** command on the gatekeeper.
7. If the intercluster trunk is not registered with the gatekeeper, turn on debug h225 asn1 on the gatekeeper and verify that there is no configuration mismatch.
8. If the call still fails, review the admissionRequest message in the debug h225 asn1 output and verify that e164 for destinationInfo and srcInfo is correct.
9. Verify that Current total bandwidth does not exceed the Maximum total bandwidth by using the **show gatekeeper zone status** command.

General Troubleshooting Tips

- In an IPT solution, Cisco recommends that the Ethernet interface for Cisco IP Phones be set to Autodetection. Cisco recommends that other Ethernet interfaces, including those for switches, routers, gateways, and Cisco Media Convergence Servers (MCSs), be set to 100 Mbps/full duplex.
- The use of the Cisco CallManager parameter VoiceMailMaximumHopCount (accessed by choosing **Service Parameters > Call Manager > Cluster Wide Parameters** from Cisco CallManager Administration) substantially reduces the amount of time required for Cisco CallManager to discover and utilize an available voice mail port in a large system. To determine the appropriate value for this parameter, identify the number of voice mail ports within each voice mail profile and subtract 3 from the largest number.

In addition, the AdvancedCallForwardHopFlag must be set to True to take advantage of this service parameter. If it is set to False the ForwardMaximumHopCount value will be used.



Note

For the effects of this parameter to be realized, a system requires at least 75 voice mail ports in a single voice mail profile. For other systems, the default configuration should be sufficient.

Additional Troubleshooting Resources

There are many Cisco documents that provide troubleshooting information at the solutions level and for various hardware and software components. [Table 11-1](#) lists some of these documents. You can find additional troubleshooting information in other product-specific documentation.

Table 11-1 Troubleshooting References

| Troubleshooting Topic | Document | URL |
|---|--|---|
| General IPT issues | <i>Troubleshooting Cisco IP Telephony</i> (published by Cisco Press, ISBN 1-58705-075-7) | — |
| Cisco ATA 186 and ATA 188 issues | <i>Cisco ATA 186 and Cisco ATA 188 Analog Telephone Adaptor Administrator's Guide (SCCP)</i> , “Troubleshooting” chapter | http://www.cisco.com/univercd/cc/td/doc/product/voice/ata/ataadm/sccp/sccpach5.htm |
| Cisco CallManager issues | <ul style="list-style-type: none"> <i>Troubleshooting Guide for Cisco CallManager</i> <i>System Error Messages for Cisco CallManager 3.3</i> | http://www.cisco.com/univercd/cc/td/doc/product/voice/c_callmg/3_3/index.htm |
| Cisco Emergency Responder issues | <i>Cisco Emergency Responder Administration Guide 1.2</i> , “Troubleshooting Cisco Emergency Responder” chapter | http://www.cisco.com/univercd/cc/td/doc/product/voice/respond/res12/admin12/e911trbl.htm |
| Cisco Customer Response Applications issues | <i>Troubleshooting Cisco Customer Response Applications</i> | http://www.cisco.com/univercd/cc/td/doc/product/voice/sw_ap_to/apps_3_1/english/admn_app/trouble/index.htm |
| Cisco Personal Assistant issues | <i>Cisco Personal Assistant Installation and Administration Guide</i> , “Troubleshooting Personal Assistant” chapter | http://www.cisco.com/univercd/cc/td/doc/product/voice/assist/assist14/ag/ag141/patrbl.htm |

Table 11-1 Troubleshooting References (continued)

| Troubleshooting Topic | Document | URL |
|----------------------------|--|---|
| Cisco SRS Telephony issues | <i>Cisco Survivable Remote Site Telephony Version 2.1</i> , “Cisco SRS Telephony Configuration” chapter | http://www.cisco.com/univercd/cc/td/doc/product/software/ios122/122newft/122t/122t15/srst21/srstbsic.htm |
| Cisco Unity issues | <i>Cisco Unity Troubleshooting Guide</i> | http://www.cisco.com/univercd/cc/td/doc/product/voice/c_unity/unity40/tsg/index.htm |
| Cisco Unity Bridge issues | <i>Cisco Unity Bridge Networking Guide</i> , “Cisco Unity Bridge Troubleshooting” chapter | http://www.cisco.com/en/US/products/sw/voicesw/ps2237/products_installation_and_configuration_guide_chapter09186a00801187d7.html |
| Cisco VG248 issues | <i>Cisco VG248 Analog Phone Gateway Software Configuration Guide</i> , “Troubleshooting the VG248” chapter | http://www.cisco.com/univercd/cc/td/doc/product/voice/c_access/apg/vg248/v1_2/sw_conf/vg248swt.htm |



Failure, Failover, and Recovery

This chapter provides an overview of the failover testing that was performed for the Cisco CallManager and the Cisco Unity components in IP Communications Systems Test Release 2.0 for IPT.

For more information about failover and recovery for a specific component, refer to the documentation for that component.

This chapter includes the following topics:

- [Cisco CallManager Failover Testing, page 12-1](#)
- [Cisco Unity Failover Testing, page 12-3](#)

Cisco CallManager Failover Testing

This section describes the following failover tests that were performed for Cisco CallManager:

- [Test 1: Shut Down Primary Cisco CallManager Server, page 12-2](#)
- [Test 2: Disconnected Cable from Primary Cisco CallManager Server, page 12-3](#)
- [Test 3: Failback, page 12-3](#)

The following conditions existed for these tests:

- Cisco CallManager cluster consisting of
 - Primary Cisco CallManagers, CM1 and CM3
 - Backup Cisco CallManagers, CM2 and CM4
 - Publisher
 - TFTP server
- Cisco CallManager servers: MCS-7845H-EVV1 with 4 GB RAM
- For Test 1 and Test 2:
 - 3,750 phones and additional gateways (Cisco Catalyst Communication Media Module, Cisco Catalyst 6608, Cisco Catalyst 6624, Cisco 3745, Cisco VG248, Cisco Analog Telephone Adaptor) registered to CM1
 - 3,750 phones and additional gateways (Cisco Catalyst Communication Media Module, Cisco Catalyst 6608, Cisco Catalyst 6624, Cisco 3745, Cisco VG248, Cisco Analog Telephone Adaptor) registered to CM2
- For Test 3:
 - No phones or gateways registered to CM1
 - 7,500 phones and additional gateways registered to CM2 after CM1 failed

Test 1: Shut Down Primary Cisco CallManager Server

Test

Made calls with 100 Cisco IP Phones and sustained the calls for long durations. Failed CM1 by shutting down the server.

Results

Verified that 3,650 phones and additional gateways failed over to CM2. 100 sustained calls did not fail over. Verified voice path for 100 phones. After calls were disconnected, the 100 phones successfully registered with CM2. Total number of phones registered with CM2 was 7,500.

Test 2: Disconnected Cable from Primary Cisco CallManager Server

Test

Made calls with 100 Cisco IP Phones and sustained the calls for long durations. Failed CM1 by disconnecting its Ethernet cable.

Results

Verified that 3,650 phones and additional gateways failed over to CM2. 100 sustained calls did not fail over. Verified voice path for 100 phones. After calls were disconnected, the 100 phones successfully registered with CM2. Total number of phones registered with CM2 was 7,500.

Test 3: Failback

Test

Made calls with 100 Cisco IP Phones and sustained the calls for long durations. Brought CM1 back into service.

Results

Verified that 3,650 phones and additional gateways failed back to CM1. 100 sustained calls did not fail back. Verified voice path for 100 phones. After calls were disconnected, the 100 phones successfully registered with CM1. Total number of phones registered with CM1 was 3,750. Total number of phones registered with CM2 was also 3,750.

Cisco Unity Failover Testing

This section describes the following failover tests that were performed for Cisco Unity:

- [Test 1: Failed the Primary Cisco CallManager, page 12-4](#)
- [Test 2: Stopped Cisco Unity Services, page 12-4](#)

- [Test 3: Disconnected Network Cable, page 12-5](#)
- [Test 4: Failback, page 12-5](#)

The following conditions existed for these tests:

- Primary Cisco Unity server located at the central site
- Backup Cisco Unity server located at the remote site
- Primary and backup Cisco Unity servers part of the same Windows 2000 site
- Primary and backup Cisco CallManager servers located at the central site
- 45 Mbps connection speed between the two Unity servers

Test 1: Failed the Primary Cisco CallManager

Test

Failed the primary Cisco CallManager to observe the failover of Cisco Unity voice ports to the backup Cisco CallManager.

Results

The failover of voice ports occurred within 15 to 45 seconds. During that time, calls could not be made to unregistered voice ports.

Test 2: Stopped Cisco Unity Services

Test

Stopped Cisco Unity services from the failover monitor.

Results

Failover from primary the Cisco Unity server to the backup Cisco Unity occurred within 15 to 20 seconds over a 45 Mbps connection.

Test 3: Disconnected Network Cable

Test

Network cable was disconnected from the Cisco Unity server.

Results

Failover from the primary Cisco Unity server to the backup Cisco Unity server occurred in 45 seconds over a 45 Mbps connection.

Test 4: Failback

Test

A specific date and time was defined for the scheduled failback.

Results

The scheduled failback from the backup Cisco Unity server to the primary Cisco Unity server occurred in 15 seconds.



Call Load Testing

This chapter provides an overview of the call loads that were tested with the various site models in IP Communications Systems Test Release 2.0 for IPT. It includes information for calls made within various site models and for calls made between site models. Calls between sites were made in a Multi-Site Distributed scenario.

The information in this chapter represents tested call rates, not the maximum call rate capabilities of the system.

This chapter includes the following topics:

- [Very Large Site Call Load Testing, page 13-1](#)
- [Large Site Call Load Testing, page 13-3](#)
- [Medium Site Call Load Testing, page 13-5](#)
- [Small Site Call Load Testing, page 13-7](#)
- [Central Site and Remote Sites Call Load Testing, page 13-8](#)

Very Large Site Call Load Testing

This section describes call load testing for calls originating in the Very Large Site model.

[Table 13-1](#) shows the number of busy hour call attempts (BHCA) that were made from the Very Large Site to the same site and to other sites. This table shows BHCA for various call types and call activities.

Table 13-1 Load Testing for Very Large Site

| Call Type | Call Activity | BHCA ¹ to Very Large Site | BHCA to Large Site | BHCA to Medium Site | BHCA to Small Site | Total BHCA |
|-------------------------|------------------|--------------------------------------|--------------------|---------------------|--------------------|------------|
| IP to IP | Basic call | 11,000 | — | — | — | 11,000 |
| | Blind transfer | 393 | — | — | — | 393 |
| | Consult transfer | 376 | — | — | — | 376 |
| | Hold | 371 | — | — | — | 371 |
| | Conference | 1,009 | — | — | — | 1,009 |
| IP to PSTN ² | Basic call | 24,000 | — | — | — | 24,000 |
| | Blind transfer | 802 | — | — | — | 802 |
| | Consult transfer | 722 | — | — | — | 722 |
| | Hold | 592 | — | — | — | 592 |
| | Conference | 1,651 | — | — | — | 1,651 |
| PSTN to IP | Basic call | 24,000 | — | — | — | 24,000 |
| | Blind transfer | 802 | — | — | — | 802 |
| | Consult transfer | 722 | — | — | — | 722 |
| | Hold | 592 | — | — | — | 592 |
| | Conference | 1,651 | — | — | — | 1,651 |
| IP to ICT ³ | Basic call | — | 3,960 | 640 | 960 | 5,560 |

Table 13-1 Load Testing for Very Large Site (continued)

| Call Type | Call Activity | BHCA ¹ to Very Large Site | BHCA to Large Site | BHCA to Medium Site | BHCA to Small Site | Total BHCA |
|---------------------------|------------------|--------------------------------------|--------------------|---------------------|--------------------|---------------|
| ICT to IP | Basic call | — | 3,000 | — | — | 3,000 |
| | Blind transfer | — | 248 | 399 | 553 | 1,200 |
| | Consult transfer | — | 361 | 568 | 771 | 1,700 |
| | Hold | — | 116 | 180 | 240 | 536 |
| | Conference | — | 338 | 514 | 675 | 1,527 |
| IP to Cisco Catalyst 6624 | Basic call | 2,240 | — | — | — | 2,240 |
| IP to Cisco VG248 | Basic call | 2,880 | — | — | — | 2,880 |
| IP to Cisco Unity | Basic call | 11,000 | — | — | — | 11,000 |
| Total BHCA | — | 84,803 | 8,023 | 2,301 | 3,199 | 98,326 |

1. BHCA = busy hour call attempts.
2. PSTN = public switched telephone network.
3. ICT = intercluster trunk.

Large Site Call Load Testing

This section describes call load testing for calls originating in the Large Site model.

Table 13-2 shows the number of busy hour call attempts (BHCA) that were made from the Large Site to the same site and to other sites. This table shows BHCA for various call types and call activities.

Table 13-2 Load Testing for Large Site

| Call Type | Call Activity | BHCA ¹ to Very Large Site | BHCA to Large Site | BHCA to Medium Site | BHCA to Small Site | Total BHCA |
|-------------------------|------------------|--------------------------------------|--------------------|---------------------|--------------------|------------|
| IP to IP | Basic call | — | 2,000 | — | — | 2,000 |
| | Blind transfer | — | 187 | — | — | 187 |
| | Consult transfer | — | 165 | — | — | 165 |
| | Hold | — | 143 | — | — | 143 |
| | Conference | — | 411 | — | — | 411 |
| IP to PSTN ² | Basic call | — | 2,400 | — | — | 2,400 |
| | Blind transfer | — | 320 | — | — | 320 |
| | Consult transfer | — | 318 | — | — | 318 |
| | Hold | — | 252 | — | — | 252 |
| | Conference | — | 727 | — | — | 727 |
| PSTN to IP | Basic call | — | 2,400 | — | — | 2,400 |
| | Blind transfer | — | 320 | — | — | 320 |
| | Consult transfer | — | 318 | — | — | 318 |
| | Hold | — | 252 | — | — | 252 |
| | Conference | — | 728 | — | — | 728 |
| IP to ICT ³ | Basic call | 1,473 | — | — | — | 1,473 |
| ICT to IP | Basic call | 1,000 | — | — | — | 1,000 |
| ICT to PSTN | Basic call | 2,000 | — | — | — | 2,000 |
| PSTN to ICT | Basic call | 2,000 | — | — | — | 2,000 |
| IP to Cisco VG248 | Basic call | 960 | — | — | — | 960 |

Table 13-2 Load Testing for Large Site (continued)

| Call Type | Call Activity | BHCA ¹ to Very Large Site | BHCA to Large Site | BHCA to Medium Site | BHCA to Small Site | Total BHCA |
|-------------------|---------------|--------------------------------------|--------------------|---------------------|--------------------|---------------|
| IP to Cisco Unity | Basic call | 2,468 | — | — | — | 2,468 |
| Total BHCA | — | 9,901 | 10,941 | — | — | 20,842 |

1. BHCA = busy hour call attempts.
2. PSTN = public switched telephone network.
3. ICT = intercluster trunk.

Medium Site Call Load Testing

This section describes call load testing for calls originating in the Medium Site model.

[Table 13-3](#) shows the number of busy hour call attempts (BHCA) that were made from the Medium Site to the same site and to other sites. This table shows BHCA for various call types and call activities.

Table 13-3 Load Testing for Medium Site

| Call Type | Call Activity | BHCA ¹ to Very Large Site | BHCA to Large Site | BHCA to Medium Site | BHCA to Small Site | Total BHCA |
|-----------|------------------|--------------------------------------|--------------------|---------------------|--------------------|------------|
| IP to IP | Basic call | — | — | 940 | — | 940 |
| | Blind transfer | — | — | 111 | — | 111 |
| | Consult transfer | — | — | 110 | — | 110 |
| | Hold | — | — | 72 | — | 72 |
| | Conference | — | — | 212 | — | 212 |

Table 13-3 Load Testing for Medium Site (continued)

| Call Type | Call Activity | BHCA ¹ to Very Large Site | BHCA to Large Site | BHCA to Medium Site | BHCA to Small Site | Total BHCA |
|-------------------------|------------------|--------------------------------------|--------------------|---------------------|--------------------|--------------|
| IP to PSTN ² | Basic call | — | — | 620 | — | 620 |
| | Blind transfer | — | — | 158 | — | 158 |
| | Consult transfer | — | — | 116 | — | 116 |
| | Hold | — | — | 118 | — | 118 |
| | Conference | — | — | 346 | — | 346 |
| PSTN to IP | Basic call | — | — | 620 | — | 620 |
| | Blind transfer | — | — | 158 | — | 158 |
| | Consult transfer | — | — | 116 | — | 116 |
| | Hold | — | — | 118 | — | 118 |
| | Conference | — | — | 346 | — | 346 |
| IP to ICT ³ | Basic call | 2,239 | — | — | — | 2,239 |
| IP to Cisco VG248 | Basic call | 640 | — | — | — | — |
| Total BHCA | — | 2,879 | — | 4,161 | — | 7,040 |

1. BHCA = busy hour call attempts.
2. PSTN = public switched telephone network.
3. ICT = intercluster trunk.

Small Site Call Load Testing

This section describes call load testing for calls originating in the Small Site model.

Table 13-4 shows the number of busy hour call attempts (BHCA) that were made from the Small Site to the same site and to other sites. This table shows BHCA for various call types and call activities.

Table 13-4 Load Testing for Small Site

| Call Type | Call Activity | BHCA ¹ to Very Large Site | BHCA to Large Site | BHCA to Medium Site | BHCA to Small Site | Total BHCA |
|-------------------------|------------------|--------------------------------------|--------------------|---------------------|--------------------|------------|
| IP to IP | Basic call | — | — | — | 620 | 620 |
| | Blind transfer | — | — | — | 77 | 77 |
| | Consult transfer | — | — | — | 57 | 57 |
| | Hold | — | — | — | 57 | 57 |
| | Conference | — | — | — | 168 | 168 |
| IP to PSTN ² | Basic call | — | — | — | 240 | 240 |
| | Blind transfer | — | — | — | 80 | 80 |
| | Consult transfer | — | — | — | 117 | 117 |
| | Hold | — | — | — | 60 | 60 |
| | Conference | — | — | — | 177 | 177 |

Table 13-4 Load Testing for Small Site (continued)

| Call Type | Call Activity | BHCA ¹ to Very Large Site | BHCA to Large Site | BHCA to Medium Site | BHCA to Small Site | Total BHCA |
|------------------------|------------------|--------------------------------------|--------------------|---------------------|--------------------|--------------|
| PSTN to IP | Basic call | — | — | — | 240 | 240 |
| | Blind transfer | — | — | — | 80 | 80 |
| | Consult transfer | — | — | — | 117 | 117 |
| | Hold | — | — | — | 60 | 60 |
| | Conference | — | — | — | 177 | 177 |
| IP to ICT ³ | Basic call | 740 | — | — | — | 740 |
| IP to Cisco VG248 | Basic call | 960 | — | — | — | — |
| Total BHCA | — | 1,700 | — | — | 2,327 | 4,027 |

1. BHCA = busy hour call attempts.
2. PSTN = public switched telephone network.
3. ICT = intercluster trunk.

Central Site and Remote Sites Call Load Testing

This section describes call load testing for calls in the Central Site model and in the Remote Site models.

Table 13-5 shows the number of busy hour call attempts (BHCA) that were made within and among the Central Site model and in the Remote Site models. This table shows BHCA for various call types and call activities.

Table 13-5 Load Testing for Central Site and Remote Sites

| Call Type | Call Activity | Total BHCA ¹ |
|--|--------------------------------------|-------------------------|
| IP to IP | 4-digit call (call within same site) | 556 |
| | 8-digit call (site-to-site call) | 1,287 |
| IP to PSTN ² and PSTN to IP (long distance calls) | 11-digit basic call | 17,455 |
| IP to PSTN and PSTN to IP (10-digit local calls) | Basic call | 5,891 |
| | Blind transfer | 1,669 |
| | Consult transfer | 2,225 |
| | Hold | 2,225 |
| | Conference | 2,225 |
| IP to Cisco Unity | Basic call | 3,500 |
| Total | — | 37,035 |

1. BHCA = busy hour call attempts.
2. PSTN = public switched telephone network.



C

- Call Admission Control (CAC) [8-2](#)
- call center, design in Very Large Site model [6-2](#)
- call flow, example [10-1 to 10-6](#)
- call load
 - testing for Central Site model [13-8](#)
 - testing for Large Site model [13-3](#)
 - testing for Medium Site model [13-5](#)
 - testing for Remote Site models [13-8](#)
 - testing for Small Site model [13-7](#)
 - testing for Very Large Site model [13-1](#)
- Central Site model
 - components [1-20](#)
 - overview [1-19](#)
 - topology [1-20](#)
- Cisco 3660 gatekeeper
 - configuration file for alternate gatekeeper [7-3](#)
 - configuration file for primary gatekeeper [7-2](#)
 - use in Very Large Site model [7-1](#)
- Cisco 3725 router, configuration file [9-8](#)
- Cisco 3745 CAMA gateway
 - configuration file [7-5](#)
 - use in Very Large Site model [7-5](#)
- Cisco 7206 router, configuration file [9-15](#)
- Cisco CallManager
 - analog telephone adaptor configuration [2-35](#)
 - calling search space configuration [2-9](#)
 - calling search spaces in Very Large Site model [2-9](#)
 - call park configuration [2-23](#)
 - Cisco CallManager configuration [2-3](#)
 - Cisco CallManagers in Very Large Site model [2-3](#)
 - conference bridge configuration [2-15](#)
 - conference bridges in Very Large Site model [2-15](#)
 - CTI route point configuration [2-28](#)
 - CTI route points in Very Large Site model [2-28](#)
 - Device menu configuration [2-27](#)
 - device pool configuration [2-6](#)
 - device pools in Very Large Site model [2-6](#)
 - device profile configuration [2-42](#)
 - failback [12-3](#)
 - failover testing [12-1](#)
 - Feature menu configuration [2-22](#)
 - gatekeeper configuration [2-30](#)
 - gatekeeper in Very Large Site model [2-30](#)
 - gateway configuration [2-30](#)

- gateways in Very Large Site model [2-31](#)
- group configuration [2-4](#)
- groups in Very Large Site model [2-4](#)
- media resource group configuration [2-19](#)
- media resource group list configuration [2-20](#)
- media resource groups in Very Large Site model [2-19](#)
- media termination point configuration [2-16](#)
- media termination points in Very Large Site model [2-16](#)
- message waiting configuration [2-25](#)
- music on hold (MOH) audio source configuration [2-17](#)
- music on hold (MOH) audio sources in Very Large Site model [2-17](#)
- music on hold (MOH) server configuration [2-17](#)
- partition configuration [2-8](#)
- partitions in Very Large Site model [2-8](#)
- phone configuration [2-35](#)
- phone services configuration [2-24](#)
- region configuration [2-6](#)
- regions in Very Large Site model [2-6](#)
- route group configuration [2-10](#)
- route groups in Very Large Site model [2-10](#)
- route list configuration [2-11](#)
- route lists in Very Large Site model [2-11](#)
- route pattern configuration [2-12](#)
- route patterns in Very Large Site model [2-12](#)
- Route Plan menu configuration [2-8](#)
- server configuration [2-2](#)
- servers in Very Large Site model [2-2](#)
- service configuration [2-21](#)
- Service menu configuration [2-15](#)
- System menu configuration [2-2](#)
- transcoder configuration [2-18](#)
- transcoders in Very Large Site model [2-18](#)
- translation pattern configuration [2-13](#)
- translation patterns in Very Large Site model [2-14](#)
- trunk configuration [2-39](#)
- trunks in Very Large Site model [2-39](#)
- use in Very Large Site model [2-1](#)
- user configuration [2-44](#)
- voice mail pilot configuration [2-26](#)
- voice mail port configuration [2-24](#)
- voice mail profile configuration [2-27](#)
- Cisco Catalyst 6509 switch, configuration file [9-1](#)
- Cisco CRA
 - configuration [6-3](#)
 - use in Very Large Site model [6-1](#)
- Cisco Emergency Responder
 - ERL configuration [4-3](#)
 - group settings configuration [4-2](#)
 - phone tracking configuration [4-4](#)
 - telephony settings configuration [4-3](#)
 - use in Very Large Site model [4-1](#)
- Cisco Personal Assistant
 - configuration overview [3-2](#)
 - enhanced TTS configuration [3-5](#)

- messaging configuration [3-4](#)
 - server configuration [3-6](#)
 - speech services configuration [3-2](#)
 - telephony provider configuration [3-3](#)
 - use in Very Large Site model [3-1](#)
- Cisco Personal Assistant Speech Server [3-1](#)
- Cisco Unity
- configuration [5-3](#)
 - failover testing [12-3](#)
 - topology [5-2](#)
 - use in Very Large Site model [5-1](#)
- Cisco Unity Bridge
- configuration [5-4](#)
 - topology [5-2](#)
 - use in Very Large Site model [5-1](#)
- components
- in Central Site model [1-20](#)
 - in Large Site model [1-14](#)
 - in Medium Site model [1-16](#)
 - in Remote Site model [1-21](#)
 - in Small Site model [1-18](#)
 - in Very Large Site model [1-10](#)
- configuration file
- for Cisco 3660 alternate gatekeeper [7-3](#)
 - for Cisco 3660 primary gatekeeper [7-2](#)
 - for Cisco 3725 router [9-8](#)
 - for Cisco 3745 gateway [7-5](#)
 - for Cisco 7206 router [9-15](#)
 - for Cisco Catalyst 6509 switch [9-1](#)
- contact service queue (CSQ), configuration [6-3](#)
-
- ## E
- Ethernet interface, recommended setting [11-3](#)
-
- ## F
- failback
- Cisco CallManager [12-3](#)
 - Cisco Unity [12-5](#)
- failover
- Cisco CallManager Ethernet cable disconnected [12-3](#)
 - Cisco CallManager server shut down [12-2](#)
 - Cisco Unity service Ethernet cable disconnected [12-5](#)
 - Cisco Unity service stopped [12-4](#)
 - Cisco Unity voice ports [12-4](#)
 - testing for Cisco CallManager [12-1](#)
 - testing for Cisco Unity [12-3](#)
- fax/modem pass-through configuration file [8-3](#)
- fax/modem pass-through mode [8-1](#)
- fax relay mode [8-1](#)
-
- ## G
- gateway, configuration [8-1](#)

H

H.323 fax relay configuration file [8-11](#)

I

IPT solution [1-1](#)

L

Large Site model

components [1-14](#)

overview [1-13](#)

topology [1-14](#)

M

Medium Site model

components [1-16](#)

overview [1-16](#)

topology [1-16](#)

MGCP fax/modem pass-through configuration
file [8-8](#)

MGCP fax relay configuration file [8-16](#)

model

Central Site [1-19](#)

in Multi-Site Centralized scenario [1-5](#)

in Multi-Site Distributed scenario [1-6](#)

in Single Site scenario [1-3](#)

Large Site [1-13](#)

Medium Site [1-16](#)

overview [1-8](#)

Remote Site [1-19, 1-21](#)

Small Site [1-17](#)

Very Large Site [1-9](#)

Multi-Site Centralized scenario

design characteristics [1-5](#)

overview [1-4](#)

Multi-Site Distributed scenario

design characteristics [1-7](#)

overview [1-6](#)

Q

Quality of Service (QoS) [9-1](#)

R

Remote Site model

components [1-21](#)

overview [1-19, 1-21](#)

topology [1-20](#)

S

scenario

Multi-Site Centralized [1-4](#)

Multi-Site Distributed [1-6](#)

Single Site [1-3](#)

Single Site scenario

design characteristics [1-3](#)

overview [1-3](#)

site model

See model

skill groups, configuration [6-4](#)

Small Site model

components [1-18](#)

overview [1-17](#)

topology [1-18](#)

T

TDD configuration [8-2](#)

topology

Cisco Unity [5-2](#)

Cisco Unity Bridge [5-2](#)

of Central Site model [1-20](#)

of Large Site model [1-14](#)

of Medium Site model [1-16](#)

of Remote Site model [1-20](#)

of Small Site model [1-18](#)

of Very Large Site model [1-10](#)

troubleshooting

inter-cluster trunk calls with
gatekeepers [11-1](#)

site-to-site IP calls [11-2](#)

TTY configuration [8-2](#)

V

Very Large Site model

components [1-10](#)

overview [1-9](#)

topology [1-10](#)

voice mail port, optimizing usage [11-3](#)

W

workflows, in Very Large Site model [6-5](#)

