



CHAPTER 2

Getting Started

This chapter describes how to set up the Cisco Unified Application Environment by accessing the management console, performing basic configuration tasks, and installing applications. It also describes how to configure an example deployment and how to plan for redundancy and load balancing.

This chapter includes these topics:

- [Before You Begin, page 2-1](#)
- [Setting Up the Cisco Unified Application Environment, page 2-2](#)
- [Configuring an Example Environment, page 2-6](#)
- [Planning for Redundancy, page 2-17](#)

Before You Begin



Note

This guide is intended for system administrators who have a basic understanding of IP telephony, and who are familiar with the Cisco Unified Communications Manager and the installed IP telephony environment.

For information on Cisco Unified Communications Manager, see

http://www.cisco.com/en/US/products/sw/voicesw/ps556/tsd_products_support_series_home.html

Before you begin setting up the Cisco Unified Application Environment make sure:

1. The Cisco MCS server is installed. See [Table 1-1 on page 1-3](#) for the supported platforms.
2. The operating system and the Cisco Unified Application Environment are installed using the DVDs shipped with the server. See *Installation Guide for the Cisco Unified Application Environment, Release 2.4* at the following URL:
http://www.cisco.com/en/US/products/ps7058/prod_installation_guide09186a00807fb85e.html
3. Obtain all the necessary the license files using the Product Authorization Key (PAK) in the Claim Certificate that is shipped with the server. See [License Management, page 3-45](#) for additional information.

Setting Up the Cisco Unified Application Environment

To set up the Cisco Unified Application Environment, you must first perform the following tasks:

[Task 1: Access and Log in to the Management Console](#)

[Task 2: Upload License Files](#)

[Task 3: Assign Media Engines to the Application Server](#)

[Task 4: Configure Cisco Unified Communications Manager Clusters to Integrate with the Cisco Unified Application Server](#)

[Task 5: Install Sample Applications](#)

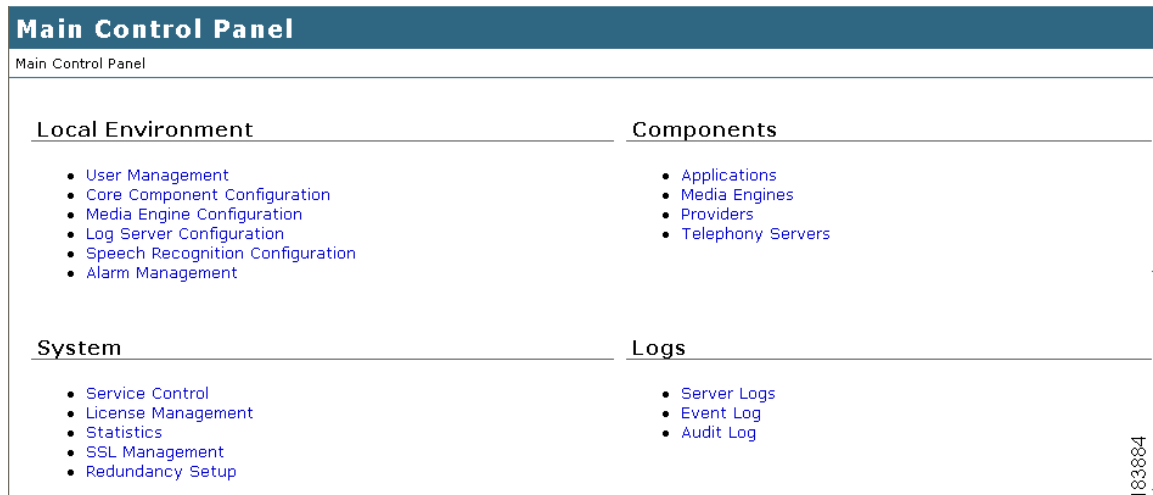
Task 1: Access and Log in to the Management Console

In this task, you must access the management console for the first time, then log in to access the Main Control Panel ([Figure 2-1](#)). Use the Main Control Panel to perform various tasks related to the environment, system, components, and logs.

This section includes these topics:

- [Accessing the Management Console, page 2-3](#)
- [Logging In to the Management Console, page 2-4](#)

Figure 2-1 Main Control Panel



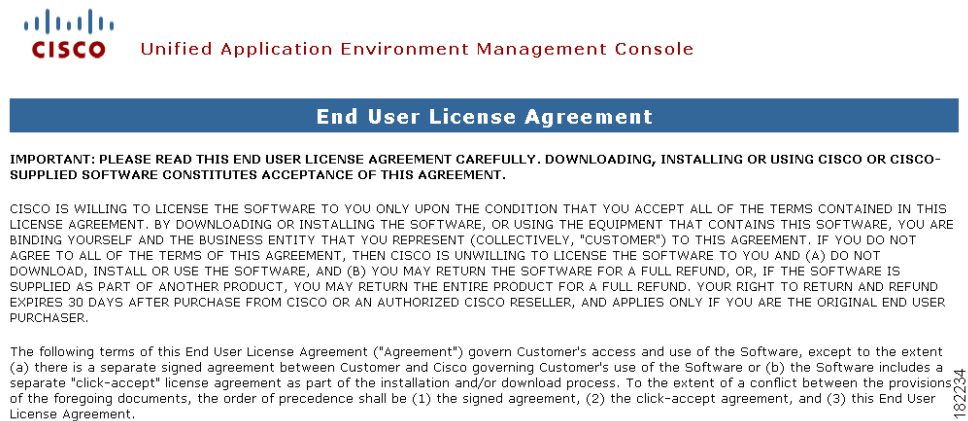
Accessing the Management Console

To access the management console for the first time, follow these steps:

Procedure

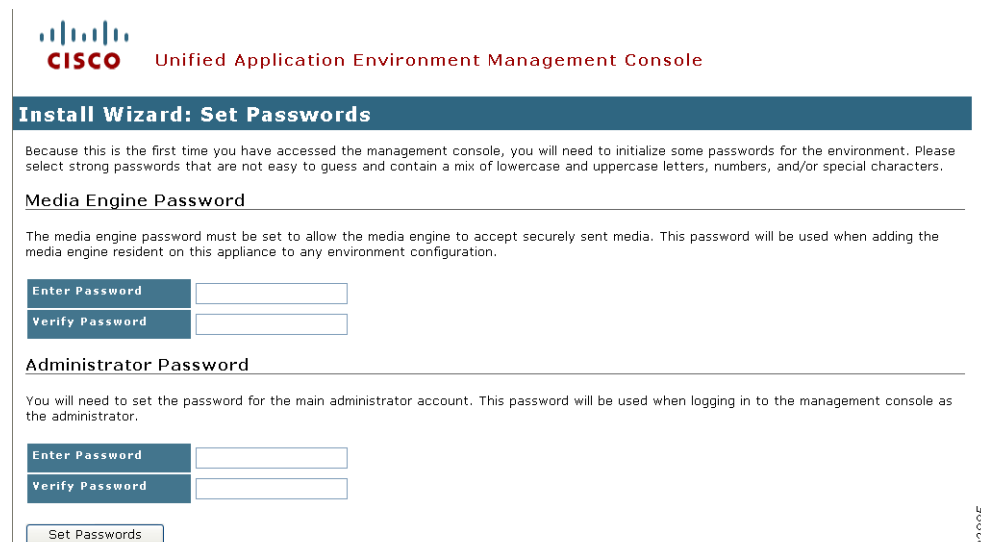
- Step 1** Open the management console URL by entering: **http://<serverIPaddress>/mceadmin**.
The End User License Agreement page appears (Figure 2-2).

Figure 2-2 End User License Agreement Page



- Step 2** Scroll to read the agreement, then click **I Agree** at the bottom of the page.
The Install Wizard: Set Passwords page appears (Figure 2-3).

Figure 2-3 Set Passwords Page



Step 3 Enter a password for the Media Engine and Administrator, reenter it, then click **Set Passwords**.



Note The username is **administrator**.

Step 4 A page appears indicating that you have successfully completed the setup.

Step 5 To log in, click **log in to the management console**, then see [Logging In to the Management Console, page 2-4](#).

Logging In to the Management Console

To log into the management console, follow these steps:

Procedure

Step 1 If you have not already done so, open the management console URL by entering:
http://<serverIPAddress>/mceadmin.

Step 2 The Management Console Login Screen opens ([Figure 2-4](#)).

Figure 2-4 Management Console Login Screen

Please log in with a **username** and **password**. If you do not have a username and password, please contact your system administrator.

Username

Password

Log In



Note While you are logged in to the management console, you can return to the Main Control Panel at any time by clicking **Main Control Panel** at the top of the screen.

Step 3 Enter the username **administrator**, and the password, then click **Log In**.

Task 2: Upload License Files

To upload license files, see [License Management, page 3-45](#).

Task 3: Assign Media Engines to the Application Server

In this task, it is assumed that the Cisco Unified Application Server will be hosting applications that use media capabilities. Therefore, you must identify the Cisco Unified Application Environment servers that have media engine software activated and licensed. When this is completed, you can add the media

engines to collections of media engines (media resource groups) and configure an application and associate each partition of the application with a media resource group. This enables the application server to automatically use the correct media engines for a given application partition and potentially load balancing as needed for media resource groups of more than one media engine.

**Note**

It is necessary to assign a media engine to support media applications even if the application server and media engine are on the same hardware platform.

To assign media engines to an application server, follow these steps:

Procedure

-
- Step 1** From the Main Control Panel, select **Media Engines**.
 - Step 2** Click **Add a Media Engine**.
 - Step 3** Enter a name of your choice to identify the media engine.
 - Step 4** Enter the media engine IP address.
 - Step 5** Enter the password required for access to the media engine, then re-enter the password to verify.
 - Step 6** Select the appropriate media resource group in the Add to Group field. For single media engine deployments, use **Default**.

**Note**

The Add to Group field lists the available media resource groups. For information on adding and assigning additional media resource groups, see the [“Applications” section on page 3-2](#).

- Step 7** Click **Add**.
-

Task 4: Configure Cisco Unified Communications Manager Clusters to Integrate with the Cisco Unified Application Server

In this task, it is assumed that you plan to use applications that perform telephony operations. Therefore, you must configure one or more telephony servers to serve as endpoints for making and receiving calls to and from the application server.

However, the specific configuration steps are dependent upon the specific telephony protocol that the application uses. The Cisco Unified Application Environment supports the following telephony protocols:

- SIP
- H.323
- CTI
- SCCP

See [Telephony Servers, page 3-28](#) for instructions on configuring IP telephony servers for each protocol.

Task 5: Install Sample Applications

In this optional task, install the sample MakeCall and AnswerCall applications that were developed using the Cisco Unified Application Designer.

**Note**

The sample applications are not required for basic operation of the Cisco Unified Application Environment and can be uninstalled at any time. They are used to perform basic integration testing to verify that the Cisco Unified Application Environment and the Cisco Unified Media Engine are communication with the Cisco Unified Communications Manager.

**Note**

The steps required to configure a standard or custom application are specific to the application and are beyond the scope of this guide. See [Task 4: Install, Configure, and Test Sample Applications, page 2-10](#) for instructions on installing and configuring sample applications.

Before You Begin

On the Cisco Unified Application Environment server, navigate to the directory C:\Program Files\Cisco Systems\Unified Application Environment\Tools\Apps, and locate the MakeCall.mca and the AnswerCall.mca sample files. If you are logged in to the Management Console remotely, you will need to put these files on your local machine, otherwise you can copy them to the desktop.

To install the sample MakeCall or AnswerCall application, follow these steps:

Procedure

- Step 1** From the Main Control Panel, click **Applications**.
- Step 2** Click **Browse...** and highlight the application file.
- Step 3** Click **Open** to make the file available for uploading.
- Step 4** Click **Upload File**.

The file is uploaded and added to the list on the Applications page.

After completing these tasks, you can use the Cisco Unified Application Environment to create, deploy, and execute converged voice and data applications. The specific procedures for these tasks differ according to your network infrastructure and application type. The next section, [Configuring an Example Environment, page 2-6](#), describes how to configure Cisco Unified Application Environment to support two sample applications, load the applications, and then execute them.

Configuring an Example Environment

This section provides an example deployment scenario for setting up and configuring a Cisco Unified Application Environment. The specific tasks required for setting up the Cisco Unified Application Environment will vary depending on the integration requirements of each application.

The required tasks for setting up the Cisco Unified Application Environment will vary according to specific protocols and applications such as these:

- Number of application servers and media engines
- Number of Cisco Unified Communications Manager clusters
- Type of telephony protocol
- Types of applications used

To show how the set-up process is typically performed, this section describes how to set up and configure an example environment having these properties:

- One Cisco Unified Application Server and one Cisco Unified Media Engine co-located on the same physical server, called the Universal Application Environment Server (Figure 1-1)
- H.323 used for telephony integration
- IP addresses for the UAE server: 10.1.1.50 and 10.1.1.51
- One Cisco Unified Communications Manager cluster consisting of a publisher and a subscriber
 - Publisher IP address: 10.1.1.100
 - Subscriber IP address: 10.1.1.101
- Sample applications used for integration
 - MakeCall
 - AnswerCall
- Route pattern of the form 5000X to route to the application server

Setting Up an Example Deployment and Performing Configuration Tasks

To set up your example deployment, you must perform these configuration tasks:



Note

The required tasks will vary according to the protocols and applications that are used.

- [Task 1: Create an H.323 Gateway Telephony Server](#)
- [Task 2: Identify the H.323 Gateway in Cisco Unified Communications Manager](#)
- [Task 3: Set Up a Route Pattern](#)
- [Task 4: Install, Configure, and Test Sample Applications](#)

Task 1: Create an H.323 Gateway Telephony Server

In this task, you will use H.323 as the IP telephony protocol by first creating a single H.323 gateway telephony server corresponding to the subscriber IP address of the Cisco Unified Communications Manager cluster. You will place the gateway into an H.323 call route group (a collection of H.323 gateways). When you later configure an application, you can associate a call route group with each application partition. By making this association, you dictate which Cisco Unified Communications Managers are signaled when an application makes a call.

The Cisco Unified Application Server refers to all H.323 endpoints as H.323 Gateways, regardless of what the remote system is. However, in practice, an H.323 Gateway always corresponds to a Cisco Unified Communications Manager.

**Note**

Cisco Unified Communications Manager servers as H.323 gateways, are the only supported model of deployment.

To create the H.323 gateway telephony server, follow these steps:

Procedure

-
- Step 1** From the Main Control Panel, click **Telephony Servers**.
 - Step 2** Select **H.323 Gateway** from the Add a Telephony Server pull-down list.
 - Step 3** Click **Add Server**.
 - Step 4** Enter a unique name and description of your choice for the gateway.
 - Step 5** Enter the IP address for the gateway, which will be a Cisco Unified Communications Manager subscriber.
 - Step 6** Verify that the default call route group setting in the Add to Group field is **Default H.323**.
 - Step 7** Click **Add H.323 Gateway** to create the gateway.
-

Task 2: Identify the H.323 Gateway in Cisco Unified Communications Manager

In this task, you must define an H.323 gateway using the Cisco Unified Communications Manager administrative interface. You must also verify that the H.323 gateway device name corresponds to the IP address or Domain Name System (DNS) name of the primary IP address of the Cisco Unified Application Server.

The Cisco Unified Communications Manager has no device corresponding to the Cisco Unified Application Server. Instead, the Cisco Unified Application Server appears as a specific device based on the protocol used for communication between the Cisco Unified Communications Manager and the Cisco Unified Application Server. In the case of H.323, the Cisco Unified Application Server appears as an H.323 gateway to the Cisco Unified Communications Manager.

To associate the H.323 gateway and identify the correct parameters, follow these steps:

Procedure

-
- Step 1** Open the Cisco Unified Communications Manager administrative web interface.
 - Step 2** Select **Device**.
 - Step 3** Select **Gateway**.
 - Step 4** Select one of these:
 - **Add a New Gateway** (3.x, 4.x)
 - **Add New** (5.x, 6.x).
 - Step 5** Select **H.323** as the gateway type, and click **Next**.

- Step 6** Enter the gateway configuration information. [Table 2-1](#) lists key fields and suggested settings.
- Step 7** Uncheck **Wait for Far End H.245 Terminal Capability Set**.
- Step 8** Click **Insert**.

Table 2-1 Gateway Configuration Information

Field	Description/Recommendation
Device Pool	Choose a device pool with the understanding that the RTP streams for this H.323 gateway terminate at the media engines in the media resource group used by partitions with this H.323 gateway in their configured media resource group.
Location	Choose a location for your deployment with the understanding that the RTP streams for this H.323 gateway terminate at the media engines in the media resource group used by partitions with this H.323 gateway in their configured media resource group.
Calling Search Space	Choose the calling search space for your deployment with the understanding that the RTP streams for this H.323 gateway terminate at the media engines in the media resource group used by partitions with this H.323 gateway in their configured call route group.
Media Resource Group List	Choose a media resource group for your deployment with the understanding that the RTP streams for this H.323 gateway terminate at the media engines in the media resource group used by partitions with this H.323 gateway in their configured media resource group. Choose the calling search space for your deployment with the understanding that the applications that have this H.323 gateway in their configured call route group will have outbound calls subject to the chosen calling search space.
Tunneled Protocol	Recommended setting: None
Signaling Port	Recommended setting: 1720
Media Termination Point	Recommended setting: Uncheck
Retry Video Call	Recommended setting: Audio
Wait for Far End H.245 Terminal Capability Set	Recommended setting: Uncheck
Outbound Calls section	Recommended setting: Use defaults

Task 3: Set Up a Route Pattern

In this task, you must set up a route pattern in Cisco Unified Communications Manager to provide a route to the H.323 gateway that you defined in [Task 2: Identify the H.323 Gateway in Cisco Unified Communications Manager, page 2-8](#).

To set up a route pattern in Cisco Unified Communications Manager, follow these steps:

Procedure

- Step 1** Open the Cisco Unified Communications Manager administrative web interface.
- Step 2** Select one of these:
- **Route Plan > Route Pattern** (3.3).
 - **Route Plan > Route/Hunt > Route Pattern** (4.x)
 - **Call Routing > Route/Hunt > Route Pattern** (5.x, 6.x)
- Step 3** Click **Add a New Route Pattern**.
- Step 4** Enter the route pattern name **5000X** in the Name field.
- Step 5** Select the gateway created in Task 2 from the **Gateway or Route List**.
- Step 6** Verify that all other fields are using their default values.
- Step 7** Click **Insert**.
-

You are now ready to install, configure, and test sample applications.

Task 4: Install, Configure, and Test Sample Applications

After completing tasks 1-3, you can install, configure, and test the following sample applications:

- [MakeCall Sample Application, page 2-11](#)

In this task, you will:

- a. Install the MakeCall application.
- b. Test outbound dialing from the application server to Cisco Unified Communications Manager.
- c. Verify the trigger parameter for the HandleMakeCall script.
- d. Make a call from the Cisco Unified Application Server to Cisco Unified Communications Manager to verify that you have successfully integrated outbound calling using H.323 and the Cisco Unified Application Environment.

- [AnswerCall Sample Application, page 2-14](#)

In this task, you will do the following:

- a. Install the AnswerCall application.
- b. Define the trigger parameter for the HandleInboundCall.
- c. Answer a call routed to the Cisco Unified Application Server to verify that you have successfully integrated inbound calling using H.323 and the Cisco Unified Application Environment.

MakeCall Sample Application

This section contains these topics:

- [Overview, page 2-11](#)
- [Installing the MakeCall Application, page 2-12](#)
- [Verifying the Trigger Parameter, page 2-13](#)
- [Testing the MakeCall Application, page 2-13](#)

Overview

The MakeCall sample application tests outbound dialing from the Cisco Unified Application Server to Cisco Unified Communications Manager as follows:

1. Uses a configured number to place an outbound call to a specified directory number (DN).
2. Plays 'goodbye' three times.
3. Hangs up on the called party.

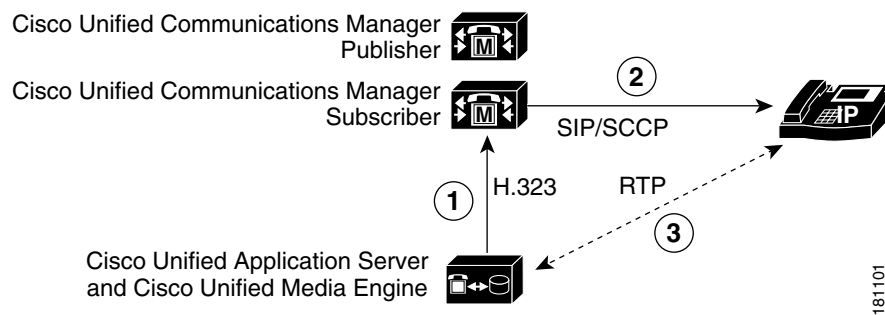
A successful outbound call indicates that the Cisco Unified Communications Manager cluster interprets the call as originating from the H.323 gateway that represents the Cisco Unified Application Server.

Making a Call to an Internal IP Phone

Figure 2-5 shows the call flow in which the MakeCall application makes a call to an internal IP phone.

1. The Cisco Unified Application Server makes an H.323 call to Cisco Unified Communications Manager.
2. Cisco Unified Communications Manager makes a call using SIP or SCCP to the IP phone as a result of the call from the Cisco Unified Application Server.
3. When the call is answered by the Cisco Unified Application Server, RTP streams are established between the IP phone and the Cisco Unified Media Engine.

Figure 2-5 MakeCall Application IP Phone Call Flow

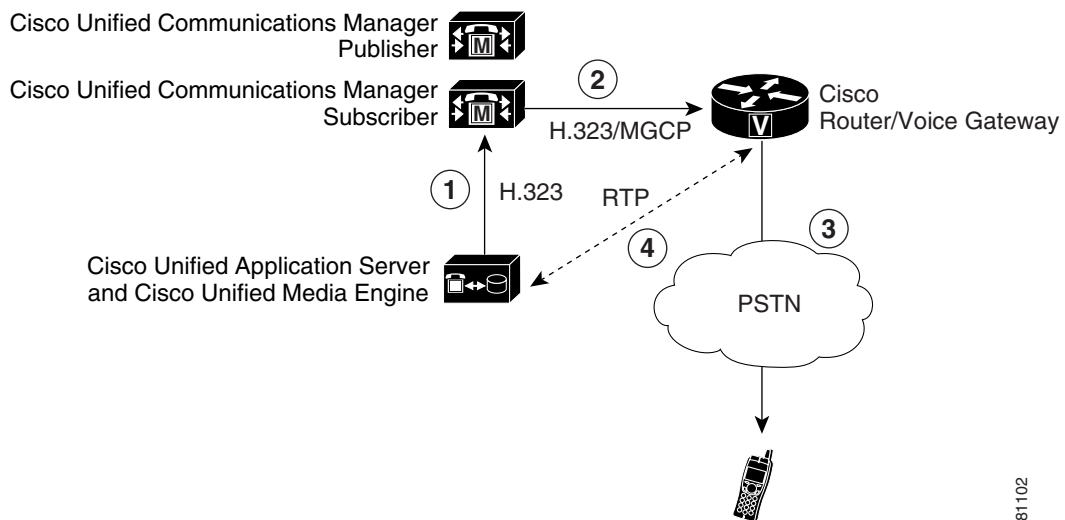


Making a Call to a PSTN Phone

Figure 2-6 shows the call flow in which the MakeCall application makes a call to a phone on the Public Switched Telephone Network (PSTN).

1. The Cisco Unified Application Server makes an H.323 call to Cisco Unified Communications Manager.
2. Cisco Unified Communications Manager makes a call using H.323, MGCP, or SCCP to the gateway as a result of the call from the application server.
3. The Cisco Voice Gateway makes a call to the PSTN as a result of the call from Cisco Unified Communications Manager.
4. When the call is answered by the phone on the PSTN, RTP streams are established between the Cisco Voice Gateway and the Cisco Unified Media Engine.

Figure 2-6 *MakeCall Application PSTN Phone Call Flow*



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Installing the MakeCall Application



Note

If you already installed the MakeCall application, go to [Verifying the Trigger Parameter, page 2-13](#).

To install the MakeCall application, follow these steps:

Before You Begin

On the Cisco Unified Application Environment server, navigate to the directory C:\Program Files\Cisco Systems\Unified Application Environment\Tools\Apps, and locate the MakeCall.mca sample file. If you are logged in to the Management Console remotely, you will need to put this file on your local machine or copy it to the desktop.

Procedure

- Step 1** From the Main Control Panel, click **Applications**.
- Step 2** Click **Browse...** and highlight the application file.

- Step 3** Click **Open** to make the file available for uploading.
- Step 4** Click **Upload File**.
The file is uploaded and added to the list on the Applications page.
- Step 5** Click **MakeCall** to configure the application.
- Step 6** Click **Apply**.
-

**Note**

Each application must execute in the context of a partition. For the MakeCall example, the application is running in the default partition. If you click the Edit button for the default partition on the MakeCall page, you will see that the default call route group and media resource group are automatically selected and that the dialed number you configured is included. See [Creating Partitions, page 3-4](#) for information on configuring partitions.

The MakeCall application incorporates the HandleMakeCall script, which triggers, or initiates, when an HTTP request is received over port 8000 on the application server. Because multiple HTTP-triggered scripts can be installed on the application server, you must verify that the HandleMakeCall script uses a unique trigger parameter.

Verifying the Trigger Parameter

To verify the trigger parameter for the HandleMakeCall script, follow these steps:

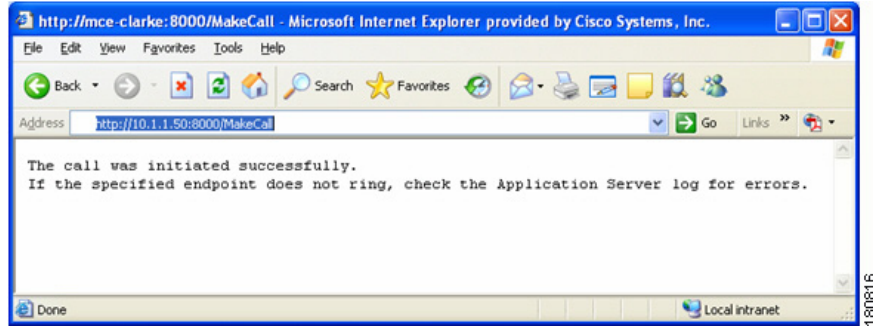
Procedure

- Step 1** From the Main Control Panel, click **Applications**.
- Step 2** Click **MakeCall** to open the MakeCall page.
- Step 3** Scroll down to the Partition section, and click **Edit** for the default partition.
- Step 4** Scroll down to the Scripts section and click **Edit Trigger Parameters**.
- Step 5** Verify that the URL trigger parameter value has the value `/MakeCall`. This means that the HandleMakeCall script will initiate when an HTTP request comes in with the URL `http://<Application Server IP>:8000/MakeCall`.
- Step 6** Click **Apply Parameter Values**.
-

Testing the MakeCall Application

After installing the MakeCall application and verifying the trigger setting, you can test the application by opening a web browser and entering `http://<Application Server IP>:8000/MakeCall`.

If the outbound call succeeds, a message is displayed, as shown in [Figure 2-7](#), and you hear ‘goodbye’ three times. This indicates you have successfully integrated outbound calling using H.323 and the Cisco Unified Application Environment.

Figure 2-7 Testing the MakeCall Application**Note**

If the test does not work, check the server logs for any errors. See [Viewing Log Information, page 5-1](#).

AnswerCall Sample Application

This section contains these topics:

- [Overview, page 2-14](#)
- [Installing the AnswerCall Application, page 2-16](#)
- [Defining the Trigger Parameter, page 2-16](#)
- [Testing the AnswerCall Application, page 2-17](#)

Overview

The AnswerCall sample application tests inbound calling to the Cisco Unified Application Server as follows:

1. Answers a call routed to the application server.
2. Plays 'goodbye' three times.
3. Hangs up on the caller.

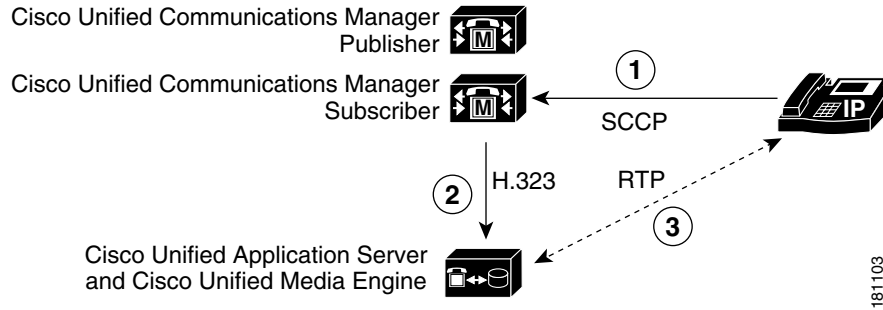
A successful call indicates that the Cisco Unified Application Server is able to receive incoming calls.

Answering a Call from an Internal IP Phone

[Figure 2-8](#) shows the call flow in which the AnswerCall application answers a call from an internal IP phone.

1. A call is made from an IP phone to Cisco Unified Communications Manager.
2. The Cisco Unified Communications Manager makes an H.323 call as a result of the call from the IP phone.
3. When the call is answered by the Cisco Unified Application Server, RTP streams are established between the IP phone and the Cisco Unified Media Engine.

Figure 2-8 AnswerCall Application IP Phone Call Flow



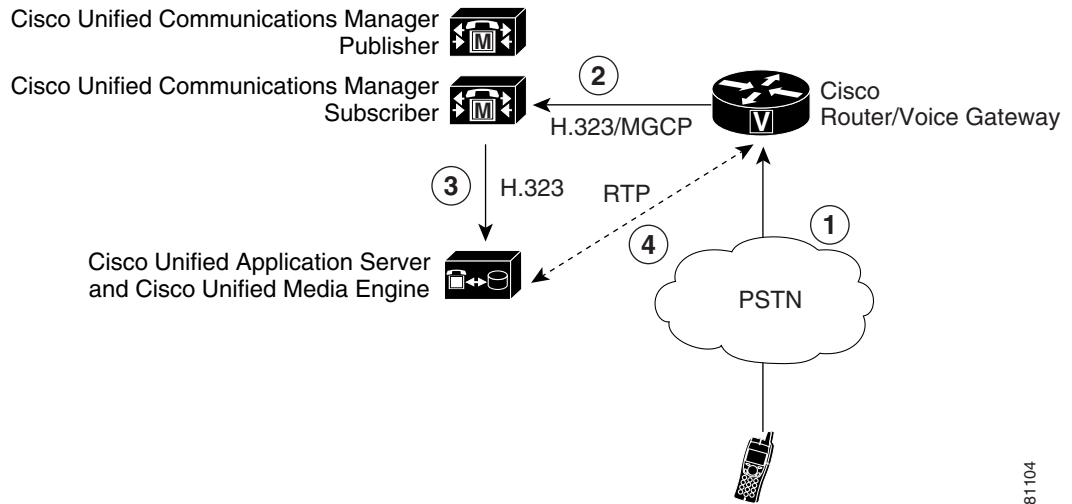
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Answering a Call from the PSTN

Figure 2-9 shows the call flow in which the AnswerCall application answers a call from the PSTN.

1. A phone on the PSTN makes a call to an H.323 or MGCP gateway.
2. The Cisco Voice Gateway makes a call to Cisco Unified Communications Manager as a result of the call from the PSTN phone.
3. The Cisco Unified Communications Manager makes an H.323 call as a result of the call from the Cisco Voice Gateway.
4. When the call is answered by the application server, RTP streams are established between the Cisco Voice Gateway and the Cisco Unified Media Engine.

Figure 2-9 AnswerCall Application PSTN Call Flow



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Installing the AnswerCall Application

If you already installed the AnswerCall application, go to [Defining the Trigger Parameter, page 2-16](#).

To install the AnswerCall application, follow these steps:

Before You Begin

On the Cisco Unified Application Environment server, navigate to the directory C:\Program Files\Cisco Systems\Unified Application Environment\Tools\Apps, and locate the AnswerCall.mca sample file. If you are logged in to the Management Console remotely, you will need to put this file on your local machine or copy it to the desktop.

Procedure

Step 1 From the Main Control Panel, click **Applications**.

Step 2 Click **Browse...** and highlight the application file.

Step 3 Click **Open** to make the file available for uploading.

Step 4 Click **Upload File**.

The file is uploaded and added to the list on the Applications page.

Step 5 Click the underlined AnswerCall link to configure the application.

Step 6 Click **Apply**.



Note

Each application must execute as a partition. For the AnswerCall example, the application is running in the default partition. If you click the Edit button for the default partition on the AnswerCall page, you will see that the default call route group and media resource group are automatically selected. See [Creating Partitions, page 3-4](#) for information on configuring partitions.

The HandleInboundCall script, which handles calls routed to the application server, does not contain pre-defined trigger parameters. However, because it is a dial-in application (you dial a number to test it), you should define a trigger parameter for the script.

For consistency with the route pattern 5000X, which was defined in [Task 3: Set Up a Route Pattern, page 2-9](#), define a trigger parameter with the name 'to' and value '50000.'

Defining the Trigger Parameter

To define the trigger parameter for the HandleInboundCall script, follow these steps:

Procedure

Step 1 From the Main Control Panel, click **Applications**.

Step 2 Click **AnswerCall** to open the AnswerCall page.

Step 3 Scroll down to the Partition section, and click **Edit** for the default partition.

Step 4 Scroll down to the Scripts section and click **Edit Trigger Parameters**.

Step 5 Enter **To** for the parameter name.

- Step 6** Enter **50000** for the initial value.
- Step 7** Click **Apply Parameter Values**.

Testing the AnswerCall Application

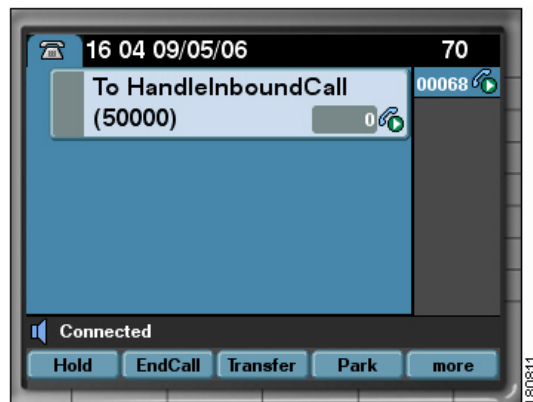
To test AnswerCall application, call 50000 from an IP phone that is configured to dial to the previously-defined route pattern (Figure 2-10). The call should be answered immediately, play goodbye three times, then hang up.



Note

If the test does not work, check the server logs for any errors. See [Viewing Log Information, page 5-1](#).

Figure 2-10 Testing the AnswerCall Application



You have now completed the installation, configuration, and testing of two sample applications. See these chapters for additional configuration and maintenance information and instructions:

- [Chapter 3, “Configuring the Cisco Unified Application Server”](#)
- [Chapter 4, “Configuring the Cisco Unified Media Engine”](#)
- [Chapter 5, “Maintaining the Cisco Unified Application Environment”](#)

Planning for Redundancy

The Cisco Unified Application Environment includes limited support for redundancy and clustering. The steps by which redundancy is implemented are different based on the type of protocol used for signaling the calls to and from the Cisco Unified Application Server.

For calls routed inbound from the Cisco Unified Communications Manager to the Cisco Unified Application Server, redundancy is set up based on the device appearance of the Cisco Unified Application Server in the Cisco Unified Communications Manager:

- **Gateway or Trunk**—If the Cisco Unified Application Environment appears as a SIP Trunk or H.323 Gateway, the Cisco Unified Communications Manager Route Lists and Route Groups can be used to define groups of Cisco Unified Application Servers.

Route Groups defined in the Cisco Unified Communication Manager inherently support failover and/or load-balancing. For example, if a call is placed to a gateway or trunk in a route group, and the receiving gateway or trunk is not responding, then the Cisco Unified Communications Manager will try the next device in the group, essentially providing redundancy.

- **Station (Phone)**—If the Cisco Unified Application Environment appears as a CTI Route Point, CTI Port, SCCP phone, or SIP phone, then the Master/Stand-By feature of the Cisco Unified Application Server can be used to define pairs of servers. These act in tandem to ensure that the registration of a particular device or set of devices is maintained (assuming at least one of the servers is up). The master/stand-by works as follows:
 - a. When a master/stand-by relationship is configured, the stand-by machines create an active replication link with the respective master servers.
 - b. If a master server becomes unreachable, the standby uses the replicated configuration information to register, in real-time, the devices held by the master server in addition to its own.
 - c. When the master server recovers, the stand-by relinquishes the devices that were originally owned by the master, then signals the master to begin registration. The master then registers its original devices.

The support for redundancy (with clustering) is subject to these limitations:

- Active calls that involve the failing server may or may not be terminated depending on the signaling protocol used and whether or not the call used media resources that were located on the failing appliance.
- All active application instances and related state information is lost during failover. Applications must take this into account when they are created by the application developer.

A pair of servers can be both a master and stand-by server to each other. This configuration allows an administrator to place half of the devices to be registered on one server and the other half on the second server. When both servers are up, neither server is fully loaded. Only when a server is down is the other fully loaded. This allows minimum system resource usage during up times thereby creating optimum performance.