



# Preparing to Install the Cisco Unified IP Phone on Your Network

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Cisco Unified IP Phones enable you to communicate using voice over a data network. To provide this capability, the IP Phones depend upon and interact with several other key Cisco IP Telephony and network components, including Cisco Unified CallManager, DNS and DHCP servers, TFTP servers, media resources, Cisco prestandard PoE, and so on.

This chapter focuses on the interactions between the Cisco Unified IP Phone 7970 Series and Cisco Unified CallManager, DNS and DHCP servers, TFTP servers, and switches. It also describes options for powering phones.

For related information about voice and IP communications, refer to this URL:

<http://www.cisco.com/en/US/partner/products/sw/voicesw/index.html>

This chapter provides an overview of the interaction between the Cisco Unified IP Phone 7970 Series and other key components of the Voice over IP (VoIP) network. It includes these topics:

- [Understanding Interactions with Other Cisco Unified IP Communications Products, page 2-2](#)
- [Providing Power to the Phone, page 2-4](#)
- [Understanding Phone Configuration Files, page 2-8](#)
- [Understanding the Phone Startup Process, page 2-9](#)
- [Adding Phones to the Cisco Unified CallManager Database, page 2-11](#)

- [Using Cisco Unified IP Phones with Different Protocols, page 2-16](#)
- [Determining the MAC Address of a Cisco Unified IP Phone, page 2-18](#)

## Understanding Interactions with Other Cisco Unified IP Communications Products

To function in the IP telephony network, the Cisco Unified IP Phone must be connected to a networking device, such as a Cisco Catalyst switch. You must also register the Cisco Unified IP Phone with a Cisco Unified CallManager system before sending and receiving calls.

This section includes these topics:

- [Understanding How the Cisco Unified IP Phone Interacts with Cisco Unified CallManager, page 2-2](#)
- [Understanding How the Cisco Unified IP Phone Interacts with the VLAN, page 2-3](#)

## Understanding How the Cisco Unified IP Phone Interacts with Cisco Unified CallManager

Cisco Unified CallManager is an open and industry-standard call processing system. Cisco Unified CallManager software sets up and tears down calls between phones, integrating traditional PBX functionality with the corporate IP network. Cisco Unified CallManager manages the components of the IP telephony system—the phones, the access gateways, and the resources necessary for such features as call conferencing and route planning. Cisco Unified CallManager also provides:

- Firmware for phones
- Authentication and encryption (if configured for the telephony system)
- Configuration file and CTL file, via TFTP service
- Phone registration
- Call preservation, so that a media session continues if signaling is lost between the primary CallManager and a phone)

For information about configuring Cisco Unified CallManager to work with the IP devices described in this chapter, refer to *Cisco Unified CallManager Administration Guide*, *Cisco Unified CallManager System Guide*, and to *Cisco Unified CallManager Security Guide*.

For an overview of security functionality for the Cisco Unified IP Phone, see the “Understanding Security Features for Cisco Unified IP Phones” section on page 1-11.

**Note**

If the Cisco Unified IP Phone model that you want to configure does not appear in the Phone Type drop-down list in Cisco Unified CallManager Administration, go to the following URL and install the latest support patch for your version of Cisco Unified CallManager:

<http://www.cisco.com/kobayashi/sw-center/sw-voice.shtml>

**Related Topic**

- [Telephony Features Available for the Phone, page 5-2](#)

## Understanding How the Cisco Unified IP Phone Interacts with the VLAN

The Cisco Unified IP Phone 7970 Series have an internal Ethernet switch, enabling forwarding of packets to the phone, and to the access port and the network port on the back of the phone.

If a computer is connected to the access port, the computer and the phone share the same physical link to the switch and share the same port on the switch. This shared physical link has the following implications for the VLAN configuration on the network:

- The current VLANs might be configured on an IP subnet basis. However, additional IP address might not be available to assign the phone to the same subnet as other devices connect to the same port.
- Data traffic present on the data/native VLAN may reduce the quality of Voice-over-IP traffic.
- Network security may indicate a need to isolate the VLAN voice traffic from the VLAN data traffic.

You can resolve these issues by isolating the voice traffic onto a separate VLAN. The switch port that the phone is connected to would be configured to have separate VLANs for carrying:

- Voice traffic to and from the IP phone (auxiliary VLAN, on the Cisco Catalyst 6000 series, for example)
- Data traffic to and from the PC connected to the switch through the access port of the IP phone (native VLAN)

Isolating the phones on a separate, auxiliary VLAN improves the quality of the voice traffic and allows a large number of phones to be added to an existing network where there are not enough IP addresses for each phone.

For more information, refer to the documentation included with a Cisco switch. You can also access related documentation at this URL:

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

#### Related Topics

- [Understanding the Phone Startup Process, page 2-9](#)
- [Network Configuration Menu, page 4-7](#)

## Providing Power to the Phone

Models in the Cisco Unified IP Phone 7970 Series can be powered with external power or with Power over Ethernet (PoE). External power is provided through a separate power supply. PoE is provided by a switch through the Ethernet cable attached to a phone.



#### Note

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When you install a phone that is powered with external power, connect the power supply to the phone and to a power outlet before you connect the Ethernet cable to the phone. When you remove a phone that is powered with external power, disconnect the Ethernet cable from the phone before you disconnect the power supply.

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These sections provide more information about powering a phone:

- [Power Guidelines, page 2-5](#)
- [Phone Power Consumption and Display Brightness, page 2-5](#)

- [Power Outage, page 2-7](#)
- [Obtaining Additional Information about Power, page 2-7](#)

## Power Guidelines

[Table 2-1](#) provides guidelines that apply to external power and to PoE power for phones the Cisco Unified IP Phone 7970 Series.

**Table 2-1 Guidelines for Powering the Cisco Unified IP Phone 7970 Series**

Power Type	Guidelines
External power— Provided through the CP-PWR-CUBE-3 external power supply	<ul style="list-style-type: none"> <li>• The Cisco Unified IP Phone 7970G and 7971G-GE use the CP-PWR-CUBE-3 power supply.</li> </ul>
PoE power—Provided by a switch through the Ethernet cable attached to the phone	<ul style="list-style-type: none"> <li>• The inline power patch panel WS-PWR-PANEL is not compatible with the Cisco Unified IP Phone.</li> <li>• To ensure uninterrupted operation of the phone, make sure that the switch has a backup power supply.</li> <li>• Make sure that the CatOS or IOS version running on your switch supports your intended phone deployment. Refer to the documentation for your switch for operating system version information.</li> </ul>

## Phone Power Consumption and Display Brightness

The power consumed by a phone depends on its power configuration. See [Table 2-1](#) for a power configuration overview. See [Table 2-2](#) for the maximum power consumed by a phone for each configuration option and the correlating phone screen brightness level.



### Note

Power consumption values shown in the table include power losses in the cable that connects the phone to the switch.

**Table 2-2 Power Consumption and Display Brightness for Power Configurations**

Phone Model	Power Configuration	Max. Power Consumed from a Switch	Phone Screen Brightness
Cisco Unified IP Phone 7970G	Cisco prestandard PoE from a switch that supports a maximum of 7 W power per port, with bidirectional power negotiation enabled	6.3 W	Approx. 1/2
	Cisco prestandard PoE from a Cisco Switch that supports 7 W or 15.4 W power per port, without bidirectional power negotiation	6.3 W	Approx. 1/2
	IEEE 802.3af Class 3 power from a Cisco switch, without bidirectional power negotiation	6.3 W	Approx. 1/2
	IEEE 802.3af Class 3 power from a third-party switch	6.3 W	Approx. 1/2
	IEEE 802.3af Class 3 power from a Cisco switch, with bidirectional power negotiation enabled	10.25 W	Full <sup>1</sup>
	Cisco prestandard PoE from a Cisco Switch that supports 15.4 W power per port, with bidirectional power negotiation enabled	10.25 W	Full
	External power	—	Full
Cisco Unified IP Phone 7971G-GE	IEEE 802.3af Class 3 power from a Cisco switch (with or without bidirectional power negotiation enabled) or from a third-party switch	15.4 W	Near full
	External power	—	Full

1. Starts at approximately 1/2 brightness, changes to full brightness when the phone negotiates additional power.

**Note**

When a phone is powered with a method that does not support full brightness for the phone screen, the phone Brightness control (**Settings > User Preferences > Brightness**) will not allow you to set the brightness to the maximum value.

## Power Outage

Your accessibility to emergency service through the phone is dependent on the phone being powered. If there is an interruption in the power supply, Service and Emergency Calling Service dialing will not function until power is restored. In the case of a power failure or disruption, you may need to reset or reconfigure equipment before using the Service or Emergency Calling Service dialing.

## Obtaining Additional Information about Power

For related information about power, refer to the documents shown in [Table 2-3](#). These documents provide information about these topics:

- Cisco switches that work with the Cisco Unified IP Phone 7970 Series
- The Cisco IOS releases that support bidirectional power negotiation
- Other requirements and restrictions regarding power

**Table 2-3** *Related Documentation for Power*

Document Topics	URL
PoE Solutions	<a href="http://www.cisco.com/en/US/netsol/ns340/ns394/ns147/ns412/networking_solutions_package.html">http://www.cisco.com/en/US/netsol/ns340/ns394/ns147/ns412/networking_solutions_package.html</a>
Cisco Catalyst Switches	<a href="http://www.cisco.com/univercd/cc/td/doc/product/lan/index.htm">http://www.cisco.com/univercd/cc/td/doc/product/lan/index.htm</a>
Integrated Service Routers	<a href="http://www.cisco.com/en/US/products/hw/routers/index.html">http://www.cisco.com/en/US/products/hw/routers/index.html</a>
Cisco IOS Software	<a href="http://www.cisco.com/en/US/products/sw/iosswrel/products_ios_cisco_ios_software_category_home.html">http://www.cisco.com/en/US/products/sw/iosswrel/products_ios_cisco_ios_software_category_home.html</a>

# Understanding Phone Configuration Files

Configuration files for a phone are stored on the TFTP server and define parameters for connecting to Cisco Unified CallManager. In general, any time you make a change in Cisco Unified CallManager that requires the phone to be reset, a change is made to the phone's configuration file automatically.

Configuration files also contain information about which image load the phone should be running. If this image load differs from the one currently loaded on a phone, the phone contacts the TFTP server to request the required load files. (These files are digitally signed to ensure the authenticity of the files' source.)

In addition, if the device security mode in the configuration file is set to Authenticated and the CTL file on the phone has a valid certificate for Cisco Unified CallManager, the phone establishes a TLS connection to Cisco Unified CallManager. Otherwise, the phone establishes a TCP connection.



## Note

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If the device security mode in the configuration file is set to Authenticated or Encrypted, but the phone has not received a CTL file, the phone will continuously try to obtain a CTL file so that it can register securely.

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If you configure security-related settings in Cisco Unified CallManager Administration, the phone configuration file will contain sensitive information. To ensure the privacy of a configuration file, you must configure it for encryption. For detailed information, refer to the “Configuring Encrypted Phone Configuration Files” chapter in *Cisco Unified CallManager Security Guide*.

A phone accesses a default configuration file named `XmlDefault.cnf.xml` from the TFTP server when these conditions exist:

- You have enabled auto-registration in Cisco Unified CallManager
- The phone has not been added to the Cisco Unified CallManager Database
- The phone is registering for the first time

If auto registration is not enabled and the phone has not been added to the Cisco Unified CallManager Database, the phone registration request will be rejected. In this case, the phone will reset and attempt to register repeatedly.

If the phone has registered before, the phone will access the configuration file named `SEPmac_address.cnf.xml`, where `mac_address` is the MAC address of the phone.



# Understanding the Phone Startup Process

When connecting to the VoIP network, the Cisco Unified IP Phone goes through a standard startup process, as described in [Table 2-4](#). Depending on your specific network configuration, not all of these process steps may occur on your Cisco Unified IP Phone.

**Table 2-4** Cisco Unified IP Phone Startup Process

Process Step	Description	Related Topics
1. Obtaining Power from the Switch	If a phone is not using external power, the switch provides in-line power through the Ethernet cable attached to the phone.	See the <a href="#">“Providing Power to the Phone”</a> section on page 2-4.  See the <a href="#">“Resolving Startup Problems”</a> section on page 9-2.
2. Loading the Stored Phone Image	The Cisco Unified IP Phone has non-volatile Flash memory in which it stores firmware images and user-defined preferences. At startup, the phone runs a bootstrap loader that loads a phone image stored in Flash memory. Using this image, the phone initializes its software and hardware.	See the <a href="#">“Resolving Startup Problems”</a> section on page 9-2.
3. Configuring VLAN	If the Cisco Unified IP Phone is connected to a Cisco switch, the switch next informs the phone of the voice VLAN defined on the switch port. The phone needs to know its VLAN membership before it can proceed with the Dynamic Host Configuration Protocol (DHCP) request for an IP address.	See the <a href="#">“Network Configuration Menu”</a> section on page 4-7.  See the <a href="#">“Resolving Startup Problems”</a> section on page 9-2.
4. Obtaining an IP Address	If the Cisco Unified IP Phone is using DHCP to obtain an IP address, the phone queries the DHCP server to obtain one. If you are not using DHCP in your network, you must assign static IP addresses to each phone locally.	See the <a href="#">“Network Configuration Menu”</a> section on page 4-7.  See the <a href="#">“Resolving Startup Problems”</a> section on page 9-2.

Table 2-4 Cisco Unified IP Phone Startup Process (continued)

Process Step	Description	Related Topics
5. Accessing a TFTP Server	<p>In addition to assigning an IP address, the DHCP server directs the Cisco Unified IP Phone to a TFTP Server. If the phone has a statically-defined IP address, you must configure the TFTP server locally on the phone; the phone then contacts the TFTP server directly.</p> <p><b>Note</b> You can also assign an alternative TFTP server to use instead of the one assigned by DHCP.</p>	<p>See the <a href="#">“Network Configuration Menu”</a> section on page 4-7.</p> <p>See the <a href="#">“Resolving Startup Problems”</a> section on page 9-2.</p>
6. Requesting the CTL file	<p>The TFTP server stores the certificate trust list (CTL) file. This file contains a list of Cisco Unified CallManagers and TFTP servers that the phone is authorized to connect to. It also contains the certificates necessary for establishing a secure connection between the phone and Cisco Unified CallManager.</p>	<p>Refer to the <i>Cisco Unified CallManager Security Guide</i>, “Configuring the Cisco CTL Client” chapter.</p>
7. Requesting the Configuration File	<p>The TFTP server has configuration files, which define parameters for connecting to Cisco Unified CallManager and other information for the phone.</p>	<p>See the <a href="#">“Understanding Phone Configuration Files”</a> section on page 2-8.</p> <p>See the <a href="#">“Resolving Startup Problems”</a> section on page 9-2.</p>

Table 2-4 Cisco Unified IP Phone Startup Process (continued)

Process Step	Description	Related Topics
8. Contacting Cisco Unified CallManager	<p>The configuration file defines how the Cisco Unified IP Phone communicates with Cisco Unified CallManager and provides a phone with its load ID. After obtaining the file from the TFTP server, the phone attempts to make a connection to the highest priority Cisco Unified CallManager on the list. If security is implemented, the phone makes a TLS connection. Otherwise, it makes a non-secure TCP connection.</p> <p>If the phone was manually added to the database, Cisco Unified CallManager identifies the phone. If the phone was not manually added to the database and auto-registration is enabled in Cisco Unified CallManager, the phone attempts to auto-register itself in the Cisco Unified CallManager database.</p> <p><b>Note</b> Auto-registration is disabled when security is enabled on Cisco Unified CallManager. In this case, the phone must be manually added to the Cisco Unified CallManager database.</p>	See the <a href="#">“Resolving Startup Problems”</a> section on page 9-2.

## Adding Phones to the Cisco Unified CallManager Database

Before installing the Cisco Unified IP phone, you must choose a method for adding phones to the Cisco Unified CallManager database. These sections describe the methods:

- [Adding Phones with Auto-Registration, page 2-12](#)
- [Adding Phones with Auto-Registration and TAPS, page 2-13](#)
- [Adding Phones with Cisco Unified CallManager Administration, page 2-14](#)
- [Adding Phones with BAT, page 2-15](#)

Table 2-5 provides an overview of these methods for adding phones to the Cisco Unified CallManager database.

**Table 2-5** *Methods for Adding Phones to the Cisco Unified CallManager Database*

Method	Requires MAC Address?	Notes
Auto-registration	No	Provides no control over directory number assignment to phone.  Not available when security or encryption is enabled.
Auto-registration with TAPS	No	Requires auto-registration and the Bulk Administration Tool (BAT); updates the Cisco Unified CallManager database with the MAC address and DNs for the device when user calls TAPS from the phone.
Using the Cisco Unified CallManager Administration	Yes	Must add phones individually.
Using BAT	Yes	Can add groups of same model of phone.  Can schedule when phones are added to the Cisco Unified CallManager database.

## Adding Phones with Auto-Registration

By enabling auto-registration before you begin installing phones, you can:

- Automatically add a Cisco Unified IP Phone to the Cisco Unified CallManager database when you physically connect the phone to your IP telephony network. During auto-registration, Cisco Unified CallManager assigns the next available sequential directory number to the phone.
- Add phones without first gathering MAC addresses from the phones.

- Quickly enter phones into the Cisco Unified CallManager database and modify any settings, such as the directory numbers, from Cisco Unified CallManager.
- Move auto-registered phones to new locations and assign them to different device pools without affecting their directory numbers.

**Note**

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You should use auto-registration to add less than 100 phones to your network. To add more than 100 phones to your network, use the Bulk Administration Tool (BAT). See the [“Adding Phones with BAT” section on page 2-15](#).

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In some cases, you might not want to use auto-registration: for example, if you want to assign a specific directory number to the phone or if you plan to implement authentication or encryption, as described in *Cisco Unified CallManager Security Guide*. For information about enabling auto-registration, refer to “Enabling Auto-Registration” in the *Cisco Unified CallManager Administration Guide*.

**Note**

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Cisco Unified CallManager automatically disables auto-registration if you configure the cluster-wide security mode for authentication and encryption through the Cisco CTL client.

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**Related Topics**

- [Adding Phones with Auto-Registration and TAPS, page 2-13](#)
- [Adding Phones with Cisco Unified CallManager Administration, page 2-14](#)
- [Adding Phones with BAT, page 2-15](#)

## Adding Phones with Auto-Registration and TAPS

TAPS, the Tool for Auto-Registered Phones Support, works with the Bulk Administration Tool (BAT) to update a batch of phones that were already added to the Cisco Unified CallManager database with dummy MAC addresses. You use TAPS to update MAC addresses and download pre-defined configurations for phones.

You can add phones with auto-registration and TAPS without first gathering MAC addresses from phones.

**Note**

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You should use auto-registration and TAPS to add less than 100 phones to your network. To add more than 100 phones to your network, use the Bulk Administration Tool (BAT). See the [“Adding Phones with BAT”](#) section on [page 2-15](#).

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To implement TAPS, you or the end-user dial a TAPS directory number and follow voice prompts. When the process is complete, the phone will have downloaded its directory number and other settings, and the phone will be updated in Cisco Unified CallManager Administration with the correct MAC address.

Auto-registration must be enabled in Cisco Unified CallManager Administration (**System > Cisco CallManager**) for TAPS to function.

**Note**

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Cisco Unified CallManager automatically disables auto-registration if you configure the cluster-wide security mode for authentication and encryption through the Cisco CTL client.

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Refer to *Cisco Unified CallManager Bulk Administration Guide* for detailed instructions about BAT and about TAPS.

**Related Topics**

- [Adding Phones with Auto-Registration, page 2-12](#)
- [Adding Phones with Cisco Unified CallManager Administration, page 2-14](#)
- [Adding Phones with BAT, page 2-15](#)

## Adding Phones with Cisco Unified CallManager Administration

You can add phones individually to the Cisco Unified CallManager database using Cisco Unified CallManager Administration. To do so, you first need to obtain the MAC address for each phone.

For information about determining a MAC address, see the [“Determining the MAC Address of a Cisco Unified IP Phone”](#) section on [page 2-18](#).

After you have collected MAC addresses, in Cisco Unified CallManager Administration, choose **Device > Phone** and click **Add New** to begin.

For complete instructions and conceptual information about Cisco Unified CallManager, refer to *Cisco Unified CallManager Administration Guide* and to *Cisco Unified CallManager System Guide*.

#### Related Topics

- [Adding Phones with Auto-Registration, page 2-12](#)
- [Adding Phones with Auto-Registration and TAPS, page 2-13](#)
- [Adding Phones with BAT, page 2-15](#)

## Adding Phones with BAT

The Cisco Bulk Administration Tool (BAT) is a plug-in application for Cisco Unified CallManager that enables you to perform batch operations, including registration, on multiple phones.

Before you can add phones using BAT only (not in conjunction with TAPS), you must obtain the MAC address for each phone.

For information about determining a MAC address, see the [“Determining the MAC Address of a Cisco Unified IP Phone”](#) section on page 2-18.

For detailed instructions about using BAT, refer to *Cisco Unified CallManager Administration Guide* and to *Cisco Unified CallManager Bulk Administration Guide*.

#### Related Topics

- [Adding Phones with Auto-Registration, page 2-12](#)
- [Adding Phones with Auto-Registration and TAPS, page 2-13](#)
- [Adding Phones with Cisco Unified CallManager Administration, page 2-14](#)

# Using Cisco Unified IP Phones with Different Protocols

The Cisco Unified IP Phone can operate with SCCP (Skinny Client Control Protocol) or SIP (Session Initiation Protocol). You can convert a phone that is using one protocol for use with the other protocol.

This section includes these topics:

- [Converting a New Phone from SCCP to SIP, page 2-16](#)
- [Converting an In-Use Phone from SCCP to SIP, page 2-17](#)
- [Converting an In-Use Phone from SIP to SCCP, page 2-17](#)
- [Deploying a Phone in an SCCP and SIP Environment, page 2-17](#)

## Converting a New Phone from SCCP to SIP

A new, unused phone is set for SCCP by default. To convert this phone to SIP, perform these steps:

### Procedure

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- Step 1** Take one of these actions:
- To auto-register the phone, set the Auto Registration Phone Protocol parameter in Cisco Unified CallManager Administration to SIP.
  - To provision the phone using the Bulk Administration Tool (BAT), choose the appropriate phone model and choose SIP from the BAT.
  - To provision the phone manually, make the appropriate changes for SIP on the Phone Configuration page in Cisco Unified CallManager Administration.

Refer to *Cisco Unified CallManager Administration Guide* for detailed information about Cisco Unified CallManager configuration. Refer to *Cisco Unified CallManager Bulk Administration Guide* for detailed information about using the BAT.

- Step 2** If you are not using DHCP in your network, configure the network parameters for the phone.



See the “Configuring Startup Network Settings” section on page 3-14.

**Step 3** Power cycle the phone.

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## Converting an In-Use Phone from SCCP to SIP

You can use the Bulk Administration Tool (BAT) to convert a phone that is in use in your network from SCCP to SIP. To access BAT from Cisco Unified CallManager Administration, choose **Bulk Administration > Phones > Migrate Phones > SCCP to SIP**. For detailed information, refer to *Cisco Unified CallManager Bulk Administration Guide*.

## Converting an In-Use Phone from SIP to SCCP

To convert a phone that is in use in your network from SIP to SCCP, perform these steps. For more information, *Cisco Unified CallManager Administration Guide*.

### Procedure

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- Step 1** In Cisco Unified CallManager Administration, delete the existing SIP phone from the Cisco Unified CallManager database.
- Step 2** In Cisco Unified CallManager Administration, create the phone as an SCCP phone.
- Step 3** Power cycle the phone.
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## Deploying a Phone in an SCCP and SIP Environment

To deploy Cisco Unified IP Phones in an environment that includes SCCP and SIP and in which the Cisco Unified CallManager Auto-Registration parameter is SCCP, perform these general steps:

1. Set the Cisco Unified CallManager `auto_registration_protocol` parameter to SCCP.

To do so, from Cisco Unified CallManager Administration, choose **System > Enterprise Parameters**.

2. Install the phones.
3. Change the auto\_registration\_protocol parameter to SIP.
4. Auto-register the SIP phones.

## Determining the MAC Address of a Cisco Unified IP Phone

You can determine the MAC address for a phone in any of these ways:

- From the phone, choose **Settings > Model Information** and look at the MAC Address field.
- Look at the MAC label on the back of the phone.
- Display the web page for the phone and click the **Device Information** hyperlink.

For information about accessing the web page, see the [“Accessing the Web Page for a Phone” section on page 8-2](#).

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