Internet Protocol Version 6 (IPv6)

Internet Protocol version 6 (IPv6), which is the latest version of the Internet Protocol (IP) that uses packets to exchange data, voice, and video traffic over digital networks, increases the number of network address bits from 32 bits in IPv4 to 128 bits. IPv6 support in the Cisco Unified Communications Manager network allows the network to behave transparently in a dual-stack environment and provides additional IP address space and autoconfiguration capabilities to devices that are connected to the network.

Use this information in conjunction with the document, Deploying IPv6 in Unified Communications Networks with Cisco Unified Communications Manager 7.1(x), which provides design guidelines for deploying IPv6 in your Cisco Unified Communications network.

This chapter, which provides information on IPv6 support for Cisco Unified Communications Manager and other components in the network, contains the following topics:

- Configuration Checklist for IPv6, page 29-2
- Introducing IPv6 for Cisco Unified Communications Manager, page 29-5
  - CTI Applications, page 29-5
  - Cisco Unified Communications Manager, page 29-6
  - Cisco Unified IP Phones, page 29-8
  - DHCPv6, page 29-10
  - DNS, page 29-11
  - Gateways, page 29-12
  - Media Termination Points, page 29-12
  - SIP Trunks, page 29-13
  - TFTP Server, page 29-15
- System Requirements for IPv6, page 29-16
- Interactions and Restrictions, page 29-16
- Installing and Activating IPv6, page 29-21
- Configuring IPv6, page 29-21
  - Running IPv6 CLI Commands or Configuring IPv6 in the Ethernet IPv6 Window, page 29-21
  - Configuring Service and Enterprise Parameters for IPv6, page 29-25
  - Accessing IPv6 and IPv4 Configuration Settings in Cisco Unified Communications Manager Administration, page 29-27
Internet Protocol version 6 (IPv6), which is the latest version of the Internet Protocol (IP) that uses packets to exchange data, voice, and video traffic over digital networks, increases the number of network address bits from 32 bits in IPv4 to 128 bits. IPv6 support in the Cisco Unified Communications Manager network allows the network to behave transparently in a dual-stack environment and provides additional IP address space and autoconfiguration capabilities to devices that are connected to the network.

Use this information in conjunction with the document, *Deploying IPv6 in Unified Communications Networks with Cisco Unified Communications Manager 7.1(x)*, which provides design guidelines for deploying IPv6 in your Cisco Unified Communications network.

Table 29-1 provides a checklist for configuring IPv6 in your network. Use Table 29-1 in conjunction with the “Related Topics” section on page 29-32.

### Table 29-1 IPv6 Configuration Checklist

<table>
<thead>
<tr>
<th>Configuration Steps</th>
<th>Related Procedures and Topics</th>
</tr>
</thead>
</table>
| **Step 1** Before you configure IPv6, review all IPv6-related documentation. | For example, review the following documents:  
  - *Deploying IPv6 in Unified Communications Networks with Cisco Unified Communications Manager 7.1(x)*  
  - *Cisco IOS IPv6 Configuration Library*  
  - *Implementing VoIP for IPv6*  
  - This IPv6 chapter |
| **Step 2** Make sure that you have compatible network hardware and Cisco IOS software that is installed and configured; for example, configure your gateways and Cisco IOS MTP for IPv6. | *Implementing VoIP for IPv6*  
*Cisco IOS Media Termination Point Configuration Settings, Cisco Unified Communications Manager Administration Guide*  
Media Termination Points, page 29-12 |
### Table 29-1  IPv6 Configuration Checklist (continued)

<table>
<thead>
<tr>
<th>Configuration Steps</th>
<th>Related Procedures and Topics</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 3</strong></td>
<td></td>
</tr>
<tr>
<td>Provision a local IPv6-capable DNS and DHCP server.</td>
<td>See the documentation that supports your DNS and DHCP server(s); for example, <em>Cisco Network Registrar User's Guide, 6.2.</em></td>
</tr>
<tr>
<td><strong>Caution</strong></td>
<td></td>
</tr>
<tr>
<td>You can provision your DNS server for IPv6 prior to upgrading from Cisco Unified Communications Manager Release 7.0(x) to Release 8.5(1). However, do not configure the DNS records for Cisco Unified Communications Manager for IPv6 until after you upgrade to Release 8.5(1). Configuring the DNS records for Cisco Unified Communications Manager for IPv6 prior to upgrading to Release 8.5(1) causes the upgrade to fail and causes your system to become nonfunctional after you reboot.</td>
<td></td>
</tr>
<tr>
<td><strong>Tip</strong></td>
<td></td>
</tr>
<tr>
<td>Cisco recommends that the Cisco Unified Communications Manager server use a static non-link-local IPv6 address. If the Cisco Unified Communications Manager server obtains the IPv6 address from the DHCPv6 server or via stateless address autoconfiguration, ensure that the Cisco Unified Communications Manager server only obtains one non-link-local IPv6 address from the DHCPv6 server.</td>
<td></td>
</tr>
<tr>
<td><strong>Step 4</strong></td>
<td></td>
</tr>
<tr>
<td>Install Cisco Unified Communications Manager 8.0 (or upgrade to this release).</td>
<td>Cisco Unified Communications Manager installation or upgrade 8.0 documentation</td>
</tr>
<tr>
<td>Before you install subsequent nodes (subscribers) in the cluster, add the IPv4 server information to the Server Configuration window in Cisco Unified Communications Manager Administration.</td>
<td><em>Server Configuration Settings, Cisco Unified Communications Manager Administration Guide</em></td>
</tr>
<tr>
<td><strong>Caution</strong></td>
<td></td>
</tr>
<tr>
<td>You can provision your DNS server for IPv6 prior to upgrading from Cisco Unified Communications Manager Release 7.0(x) to Release 8.5(1). However, do not configure the DNS records for Cisco Unified Communications Manager for IPv6 until after you upgrade to Release 8.5(1). Configuring the DNS records for Cisco Unified Communications Manager for IPv6 prior to upgrading to Release 8.5(1) causes the upgrade to fail and causes your system to become nonfunctional after you reboot.</td>
<td></td>
</tr>
<tr>
<td><strong>Step 5</strong></td>
<td></td>
</tr>
<tr>
<td>Enable IPv6 in the Cisco Unified Communications Operating System and ensure that the Cisco Unified Communications Manager server obtains an IPv6 address.</td>
<td>Cisco Unified Communications Manager, page 29-6</td>
</tr>
<tr>
<td>Cisco recommends that the Cisco Unified Communications Manager server use a static non-link-local IPv6 address.</td>
<td><em>Running IPv6 CLI Commands or Configuring IPv6 in the Ethernet IPv6 Window, page 29-21</em></td>
</tr>
<tr>
<td><strong>Tip</strong></td>
<td></td>
</tr>
<tr>
<td>For each server in the cluster, perform these tasks. Performing these tasks requires a reboot of the server.</td>
<td></td>
</tr>
</tbody>
</table>
### Configuration Checklist for IPv6 (continued)

<table>
<thead>
<tr>
<th>Configuration Steps</th>
<th>Related Procedures and Topics</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 6</strong></td>
<td></td>
</tr>
<tr>
<td>In the Enterprise Parameters Configuration window in Cisco Unified Communications Manager Administration, choose <strong>True</strong> for the Enable IPv6 enterprise parameter.</td>
<td>Configuring Service and Enterprise Parameters for IPv6, page 29-25</td>
</tr>
<tr>
<td><strong>Tip</strong></td>
<td></td>
</tr>
<tr>
<td>After you update this enterprise parameter, restart the Cisco CallManager, CTIManager and the Certificate Authority Proxy Function services in Cisco Unified Serviceability.</td>
<td></td>
</tr>
<tr>
<td><strong>Step 7</strong></td>
<td></td>
</tr>
<tr>
<td>For the server that you are configuring in Cisco Unified Communications Manager Administration, choose <strong>System &gt; Server</strong> and enter the non-link-local IPv6 address or a host name that can resolve to a IPv6 address in the IPv6 Name field.</td>
<td>Server Configuration Settings, Cisco Unified Communications Manager Administration Guide</td>
</tr>
<tr>
<td><strong>Tip</strong></td>
<td></td>
</tr>
<tr>
<td>For each server in the cluster, perform this task.</td>
<td>Accessing IPv6 and IPv4 Configuration Settings in Cisco Unified Communications Manager Administration, page 29-27</td>
</tr>
<tr>
<td><strong>Tip</strong></td>
<td></td>
</tr>
<tr>
<td>Remember to update the DNS server with the appropriate Cisco Unified Communications Manager name and address information.</td>
<td></td>
</tr>
<tr>
<td><strong>Caution</strong></td>
<td></td>
</tr>
<tr>
<td>You can provision your DNS server for IPv6 prior to upgrading from Cisco Unified Communications Manager Release 7.0(x) to Release 8.5(1). However, do not configure the DNS records for IPv6 for Cisco Unified Communications Manager until after you upgrade to Release 8.5(1). Configuring the DNS records for IPv6 for Cisco Unified Communications Manager prior to upgrading to Release 8.5(1) causes the upgrade to fail and causes your system to become nonfunctional after you reboot.</td>
<td></td>
</tr>
</tbody>
</table>

To display the non-link-local IPv6 address, you can run a CLI command or view it in the Ethernet IPv6 window, as described in the “Running IPv6 CLI Commands or Configuring IPv6 in the Ethernet IPv6 Window” section on page 29-21.
Introducing IPv6 for Cisco Unified Communications Manager

This section contains information on the following topics:

- CTI Applications, page 29-5
- Cisco Unified Communications Manager, page 29-6
- Cisco Unified IP Phones, page 29-8
- DHCPv6, page 29-10
- DNS, page 29-11
- Gateways, page 29-12
- Media Termination Points, page 29-12
- SIP Trunks, page 29-13
- TFTP Server, page 29-15
- Interactions and Restrictions, page 29-16

CTI Applications

CTI provides IP address information through the JTAPI and TAPI interfaces, which can support IPv4 and IPv6 addresses. To support IPv6, applications need to use a JTAPI/TAPI client interface version that supports IPv6. Consider the following information for CTI applications and CTI port/route points:

- CTI applications connect to CTI Manager by using either an IPv4 or an IPv6 address. If you set the Enable IPv6 enterprise parameter to True in Cisco Unified Communications Manager Administration, CTI Manager can support CTI connections from applications that use IPv6 addresses.
Cisco Unified Communications Manager

This section describes how Cisco Unified Communications Manager supports devices that use IPv4, IPv6, or IPv4 and IPv6. In addition, this section describes how Cisco Unified Communications Manager runs in dual-stack mode, how Cisco Unified Communications Manager can process calls for IPv4 and IPv6 devices, and how Cisco Unified Communications Manager can reserve and allocate bandwidth for IPv4 and IPv6 calls.

See the following sections:

- Cisco Unified Communications Manager Server, page 29-6
- Call Processing, page 29-7
- Call Admission Control (CAC), page 29-8

Tip

This document uses the terminology, dual stack (or dual-stack mode), which assumes that the device or server uses both an IPv4 and an IPv6 address.

Cisco Unified Communications Manager Server

Cisco Unified Communications Manager can interact with and support devices that use IPv6 only, but you cannot configure the Cisco Unified Communications Manager server as IPv6 only because Cisco Unified Communications Manager must interact with and support devices/features that support IPv4 only (or both IPv4 and IPv6). For Cisco Unified Communications Manager to support devices that use IPv6, including dual-stack devices, which can provide both IPv4 and IPv6 addresses, you must configure Cisco Unified Communications Manager, so it runs in dual-stack mode; that is, you must ensure that the Cisco Unified Communications Manager server has both an IPv4 address and an IPv6 address that is configured for it, so it can interact and support devices that use IPv4 only, IPv6 only, or both IPv4 and IPv6.

Tip

Intracluster Cisco Unified Communications Manager node-to-node communication uses IPv4.

Before the Cisco Unified Communications Manager server can run in dual-stack mode, you must perform the following tasks:

1. On the Cisco Unified Communications Manager server, enable IPv6 in the Cisco Unified Communications Operating System.

2. Determine how the Cisco Unified Communications Manager server will get its IPv6 address, and ensure that the Cisco Unified Communications Manager server obtains its IPv6 address.

In the Cisco Unified Communications Operating System, you can request a non-link-local address from the DHCPv6 server, configure a static non-link-local IPv6 address for the Cisco Unified Communications Manager server, or obtain an non-link-local IPv6 address via stateless address autoconfiguration. (Cisco recommends a static non-link-local IPv6 address for the server.)
Ensure that the Cisco Unified Communications Manager server only obtains one non-link local IPv6 address. If the server obtains more than one IPv6 address, Cisco Unified Communications Manager may not behave as expected.

If the Cisco Unified Communications Manager server obtains an IPv6 address via stateless address autoconfiguration and you also have a static IPv6 address that is configured for the server, Cisco Unified Communications Manager ignores the IPv6 address that is obtained via stateless address autoconfiguration and uses the static address.

3. For Cisco Unified Communications Manager, set the Enable IPv6 enterprise parameter to True, which ensures that Cisco Unified Communications Manager runs in dual-stack mode. For information on this enterprise parameter, see the “Configuring Service and Enterprise Parameters for IPv6” section on page 29-25.

Caution

You must enable IPv6 in the Cisco Unified Communications Operating System and set the Enable IPv6 enterprise parameter to True. If you do not perform both of these tasks, the Cisco CallManager service runs in IPv4 and phones that you configure with an IP Addressing Mode of IPv6 Only cannot register with Cisco Unified Communications Manager.

After you perform these tasks on the server, you must restart the server for the changes to take effect.

4. In Cisco Unified Communications Manager Administration, configure the Host Name/IP Address and IPv6 Name fields in the Server Configuration window, which ensures that Cisco Unified Communications Manager runs in dual-stack mode. Cisco Unified Communications Manager considers the Host Name/IP Address field mandatory; that is, you must configure this field even if devices in your network only support IPv6. If devices in your network support IPv6 only or IPv4 and IPv6, you must configure the IPv6 Name field in addition to the IP Address/Hostname field; be aware that you must enter the non-link local IPv6 address for the Cisco Unified Communications Manager in the IPv6 Name field.

The phones use these fields, which are included in the TFTP configuration file, to retrieve the IP addresses of the Cisco Unified Communications Manager server, so phone registration occurs.

Call Processing

By running in dual-stack mode, Cisco Unified Communications Manager can set up calls under the following circumstances:

- When all devices support IPv4 only.
- When all devices support IPv6 only.
- When all devices run in dual-stack mode, in which case, Cisco Unified Communications Manager uses the configuration for the IP Addressing Mode Preference for Signaling setting for signaling events and the IP Addressing Mode Preference for Media enterprise parameter for media events.
- When one device supports IPv4 and another device supports IPv6, in which case, Cisco Unified Communications Manager attempts to insert into the call an MTP that can translate IPv4 to IPv6.

Tip

Even if your device can support multiple IPv6 addresses, Cisco Unified Communications Manager only handles one IPv6 address. In addition, if your device supports an IPv4 and IPv6 address, Cisco Unified Communications Manager can simultaneously handle both addresses.
For more information on how Cisco Unified Communications Manager handles IPv4 and IPv6 calls, see the “Cisco Unified IP Phones” section on page 29-8, the “Media Termination Points” section on page 29-12, the “SIP Trunks” section on page 29-13, and the “Interactions and Restrictions” section on page 29-16.

Call Admission Control (CAC)

Because using IPv6 requires 20 more bytes of data in its header than IPv4, an IPv6 call requires more bandwidth than a similar IPv4 call that uses the same codec/media payload type. For example, a G.711 call that uses IPv4 uses 80 kb/s of bandwidth; whereas, a G.711 call that uses IPv6 uses 88 kb/s of bandwidth.

To reserve and adjust location-based bandwidth for a call that uses IPv6, Cisco Unified Communications Manager can calculate the bandwidth that is needed for an IPv6 call for all codecs that are supported with Cisco Unified Communications Manager. After the device contacts Cisco Unified Communications Manager for bandwidth reservation during the call setup, Cisco Unified Communications Manager identifies the IP version; if the call uses IPv6, Cisco Unified Communications Manager reserves the bandwidth for IPv6, and if the call uses IPv4, Cisco Unified Communications Manager reserves the bandwidth for IPv4. If Cisco Unified Communications Manager cannot identify the IP version that is used for the call, for example, the call terminates to a SIP trunk or the device supports both IP versions, Cisco Unified Communications Manager initially reserves bandwidth that supports IPv6 and later adjusts the bandwidth after media negotiation occurs.

Tip

Cisco Unified Communications Manager reserves bandwidth for one call leg at a time, so, if an MTP is inserted into the call and location-based CAC is required, ensure that the MTP is colocated with one of the devices, so location-based CAC reserves the bandwidth across the WAN based on the side that is opposite of the MTP. For example, if a call occurs from an IPv4 to IPv6 device, which causes an insertion of the MTP on the IPv4 side, Cisco Unified Communications Manager reserves bandwidth across the WAN based on IPv6. Alternatively, if the MTP is inserted for the device that uses IPv6, Cisco Unified Communications Manager reserves bandwidth across the WAN based on IPv4.

If you want to do so, you can configure the Call Counting CAC Enabled, Audio Bandwidth for Call Counting CAC, and the Video Bandwidth Unit for Call Counting CAC service parameters in Cisco Unified Communications Manager Administration, so the call uses a fixed bandwidth value instead of having Cisco Unified Communications Manager reserve and adjust bandwidth during the call. For information on these service parameters, see the “Configuring Service and Enterprise Parameters for IPv6” section on page 29-25. Be aware that configuring these service parameters can cause Cisco Unified Communications Manager to oversubscribe or undersubscribe bandwidth for the call.

Cisco Unified IP Phones

This section describes use cases for IPv4 and IPv6 calls between the phone and Cisco Unified Communications Manager. This section does not describe how the phone gets its IP address and other network settings.

Tip

For additional information on using IPv6 with your phone, see the Cisco Unified IP Phone Administration Guide that supports your phone model and this release of Cisco Unified Communications Manager. The phone administration guide describes IPv6 settings that display on the phone.
See the following use cases, which assume that Cisco Unified Communications Manager can listen on the correct port, that an MTP is available to translate IP address versions, and that the device has the correct address version:

- **Phone Has IP Addressing Mode of IPv4 Only**
- **Phone Has IP Addressing Mode of IPv6 Only**
- **Phone Has IP Addressing Mode of IPv4 and IPv6**

**Tip**

Every time that the phone boots up, it boots up in dual-stack mode; that is, it can support both IPv4 and IPv6. After the phone processes the configuration file from the TFTP server, the IP Addressing Mode from the Common Device Configuration window gets set on the phone. Based on the IP Addressing Mode, the phone may disable DHCP or DHCPv6 and may release addresses that do not support the IP Addressing Mode; for example, if the IP Addressing Mode is IPv4 Only, the phone releases the IPv4 address.

If the phone has multiple, unique local or multiple global addresses, the first address that is assigned to the phone specifies the address that gets sent to Cisco Unified Communications Manager for signaling and media events. If a phone that runs in dual-stack mode loses a specific address type, the phone unregisters from Cisco Unified Communications Manager and reregisters with the remaining address type.

For media negotiation, Cisco Unified Communications Manager dynamically determines the IP address to use for the call; that is, Cisco Unified Communications Manager identifies whether the devices share the IP Addressing Mode; for example, if one device has an IP Addressing Mode of IPv4 and IPv6 and the other device has an IP Addressing Mode of IPv4 Only, Cisco Unified Communications Manager uses IPv4 for the media negotiation and requires no MTP for translating IP address versions. If the devices on the call only support one IP address version and the versions are not compatible, Cisco Unified Communications Manager uses the IP address version of the device and tries to insert an MTP into the call that can translate IPv4 to IPv6. If all devices on the call support both IP address versions, Cisco Unified Communications Manager uses the configuration for the IP Addressing Mode Preference for Media enterprise parameter for the media negotiation.

**Phone Has IP Addressing Mode of IPv4 Only**

If the IP Addressing Mode for the phone is IPv4 Only, the phone connects to Cisco Unified Communications Manager by using an IPv4 address. Signaling and media negotiation occurs by using an IPv4 address. If an IPv4 address is not available for the phone, the user cannot make calls.

**Phone Has IP Addressing Mode of IPv6 Only**

If the IP Addressing Mode for the phone is IPv6 Only and you set the Enable IPv6 enterprise parameter to True, the phone uses a global scope or unique local scope IPv6 address to connect to Cisco Unified Communications Manager. Signaling and media negotiation occur by using this IPv6 address. If an IPv6 address is not available for the phone, the user cannot make calls. Likewise, if an IPv6 address is not configured for the phone, the phone cannot register with Cisco Unified Communications Manager.
Introducing IPv6 for Cisco Unified Communications Manager

Tip
Cisco Unified Communications Manager does not support all features on phones where the IP Addressing Mode is IPv6 Only. For a list of features that are not supported, see the “Interactions and Restrictions” section on page 29-16.

If you configure IPv6 Only as the IP Addressing Mode for phones that run SIP, the Cisco TFTP service overrides the IP Addressing Mode configuration and uses IPv4 Only in the configuration file.

Phone Has IP Addressing Mode of IPv4 and IPv6
If the IP Addressing Mode for the phone is IPv4 and IPv6 and you set the Enable IPv6 enterprise parameter to True, Cisco Unified Communications Manager considers the IP address support for the phone and the configuration for IP Addressing Mode Preference for Signaling setting before connecting the call.

If only one IP address version is available on the phone, the phone uses the address that is available to connect to Cisco Unified Communications Manager for signaling negotiation. If both IP addresses types are available on the phone, the phone uses the configuration for the IP Addressing Mode for Signaling setting for signaling negotiation.

Tip
After you configure the phone in Cisco Unified Communications Manager Administration, you can view the IP address for the phone in the Find and List Phones window. For phones that have an IPv4 address only or both IPv4 and IPv6 addresses, the IPv4 address displays in the window. For phones with an IPv6 address only, the IP Address displays as 0.0.0.0 in the IP Address column in the Find and List Phones window. To identify the IPv6 address for the phone, click the Device Name link in the Find and List Phones window, which causes the Phone Configuration window to display. For the IPv6 Only device, the Phone Configuration window displays an IPv4 address of 0.0.0.0, listed as IP Address, above the IPv6 address.

In the Phone Configuration window for a specific phone, you can view the IPv4 address and the IPv6 address, if applicable, that the phone uses. For phones in dual-stack mode that have both an IPv4 and IPv6 address, you can click the IPv4 or IPv6 address in the Phone Configuration window, which points to an IPv4 URL for the web server on the phone. For phones that use an IPv6 address only, you cannot click the IPv6 address because the web server on the phone only supports IPv4.

DHCPv6
DHCPv6, which is the version of Dynamic Host Configuration Protocol that supports IPv6, can assign an IPv6 address and other network settings to the phone after you connect it to the network. In addition, DHCPv6 can assign an IPv6 address to the Cisco Unified Communications Manager server; that is, if you do not plan to assign a static IP address to the server. (Cisco recommends that you assign a static IP address to the server.)

Cisco Unified Communications Manager 7.1 does not provide DHCPv6 server capabilities, so you must configure a DHCPv6 server in your network if you plan to use DHCPv6 to assign IPv6 network configuration settings to the phone or server. If you want to allow the phone to receive its IP address via DHCPv6 rather than stateless address autoconfiguration, make sure that you set the Allow Auto-Configuration for Phones setting to Off. For information on this setting, see the “Accessing IPv6 and IPv4 Configuration Settings in Cisco Unified Communications Manager Administration” section on page 29-27.
Because Cisco Network Registrar (CNR) 6.2 provides both DNS and DHCP support for IPv4 and IPv6, consider using Cisco Network Registrar for your DNS and DHCP support. For more information on this product, see the Cisco Network Registrar User’s Guide, 6.2.

If you want to do so, you can configure a Cisco IOS router or switch as a DHCPv6 server; for example, you can configure a Cisco Catalyst 3560 Series Switch or a Cisco Catalyst 3750 Series Switch that runs 12.2(46)SE (or later) as a DHCPv6 server. Before you configure this router/switch, verify that your router/switch supports the Cisco vendor-specific DHCPv6 information options that are required for IPv6 and DHCPv6 support.

For highest scope rules, consider configuring a DHCPv6 server, so it assigns only unique local addresses to the phone. If you must use global unicast addresses, configure a TLS connection and SRTP, as described in the Cisco Unified Communications Manager Security Guide.

For additional information on DHCP, see the “TFTP Server” section on page 29-15, the Cisco TFTP in the Cisco Unified Communications Manager System Guide, and Deploying IPv6 in Unified Communications Networks with Cisco Unified Communications Manager 7.1(x).

DNS

For IPv6, DNSv6 handles the AAAA record, which can map IPv6 addresses. For IPv4, DNS handles the A record, which can map IPv4 addresses. For IPv4 and IPv6, the following fields rely on DNS; that is, if you configure hostnames for the fields:

- **Host Name/IP Address (Server Configuration window)** — You can enter an IPv4 address or hostname.
- **IPv6 Name (Server Configuration window)** — You can enter an IPv6 address or hostname.
- **Destination Address (SIP Trunk Configuration window)** — You can enter a valid V4 dotted IP address, a fully qualified domain name (FQDN), or DNS SRV record if the Destination Address is an SRV field is checked.
- **Destination Address IPv6 (SIP Trunk Configuration window)** — The allowed values for this field specify a valid IPv6 address (global unicast, unique local, or a hostname), a fully qualified domain name (FQDN), or a DNS SRV record if the Destination Address is an SRV field is checked.

You can provision your DNS server for IPv6 prior to upgrading from Cisco Unified Communications Manager Release 7.0(x) to Release 8.5(1). However, do not configure the DNS records for Cisco Unified Communications Manager for IPv6 until after you upgrade to Release 8.5(1). Configuring the DNS records for Cisco Unified Communications Manager for IPv6 prior to upgrading to Release 8.5(1) causes the upgrade to fail and causes your system to become nonfunctional after you reboot.

If the AAAA record or A record do not map correctly, calls may fail.
Introducing IPv6 for Cisco Unified Communications Manager

Because Cisco Network Registrar (CNR) 6.2 provides both DNS and DHCP support for IPv4 and IPv6, consider using CNR for your DNS and DHCP support. For more information on this product, see the Cisco Network Registrar User’s Guide, 6.2.

Gateways

MGCP and H.323 gateways do not support IPv6. To communicate with IPv6 devices that connect to these gateways, Cisco Unified Communications Manager inserts an MTP that can translate IPv4 to IPv6 during a call.

The Cisco ATA 186 and 188 Analog Telephone Adaptors do not support IPv6.

Analog phone gateways can operate in IPv4 only, IPv6 only, or IPv4 and IPv6 (dual-stack mode).

Cisco IOS SIP gateways can support IPv6 only, IPv4 only, or IPv4 and IPv6 simultaneously in dual-stack mode. Before Cisco Unified Communications Manager can interact with these gateways, you must configure it in the SIP Trunk Configuration window in Cisco Unified Communications Manager Administration. For Cisco Unified Communications Manager considerations for the gateway, review the “SIP Trunks” section on page 29-13 and the “Media Termination Points” section on page 29-12. In addition to configuring the gateway in Cisco Unified Communications Manager Administration, you must configure the gateway, as described in Implementing VoIP for IPv6.

Media Termination Points

This section describes how Cisco Unified Communications Manager inserts MTPs into calls that require IPv4 to IPv6 translation. For information on how to configure your Cisco IOS MTP, so the MTP can support IP translation, see Implementing VoIP for IPv6.

Although the Cisco IOS MTP can support multiple IPv6 addresses, the MTP sends either a global or unique local address to Cisco Unified Communications Manager for signaling and media events.

Cisco IOS MTP supports media interoperation between IPv4 and IPv6 networks. Cisco IOS MTP for IPv4-to-IPv6 media translation operates only in dual-stack mode. In Cisco Unified Communications Manager Administration, only the Cisco IOS Enhanced Media Termination Point option for MTPs (Media Resources > Media Termination Point) and transcoders (Media Resources > Transcoder) support the translation functionality; that is, the software MTP component in the Cisco IP Voice Media Streaming Application does not support IPv4 to IPv6 translation.

When Cisco Unified Communications Manager allocates an MTP, the MTP may get used for more than one feature at the same time. Because the MTP can get used for multiple features, Cisco Unified Communications Manager prioritizes MTP allocation to ensure that IPv6 and IPv4 are supported before other features that rely on MTP get supported.
Under the following circumstances, Cisco Unified Communications Manager inserts an MTP that can translate IPv4 to IPv6 (or vice versa):

- The devices on the call do not support the same IP address version.
- For the SIP trunk, you check the Media Termination Points Required check box or configure the Use Trusted Relay Point as **On** and Cisco Unified Communications Manager is communicating with devices that use IPv6 addresses. If you check the Media Termination Points Required check box for the SIP trunk or you need an MTP inserted into the call for any other reason besides IPv4 to IPv6 translation, the following considerations exist:
  - If both parties of the call can negotiate IPv4 without using an MTP, Cisco Unified Communications Manager does not insert an MTP into the call.
  - When the IP Addressing Mode is IPv6 Only or IPv4 and IPv6 for the SIP trunk, Cisco Unified Communications Manager allocates an MTP that can translate IPv4 to IPv6 (or vice versa) for the call. If no MTP that can translate IP address versions is available for the call, Cisco Unified Communications Manager allocates an MTP that supports IPv4 for the SIP trunk that is configured in dual-stack mode; for a SIP trunk that is configured as IPv6 Only, Cisco Unified Communications Manager sends an INVITE message without SDP session descriptions.

When Cisco Unified Communications Manager communicates with the MTP, Cisco Unified Communications Manager requests either an IPv4 or IPv6 address. If Cisco Unified Communications Manager requests an IPv4 address, the MTP opens an RTP port that supports IPv4. If Cisco Unified Communications Manager supports IPv6, the MTP opens an RTP port that supports IPv6.

If the request for an MTP that can translate IPv4 to IPv6 fails, the call may fail because IPv6 is required for the call. If an MTP that can translate IP address versions is inserted into the call, any intermediate media device that is inserted between the IPv6 device and the MTP must handle IPv6 requests. If Cisco Unified Communications Manager has two MTPs available and each MTP can perform only one function, Cisco Unified Communications Manager attempts to insert both MTPs into the call, the first MTP for the IPv4-to-IPv6 translation and the second MTP to support other features that require MTP. If a call requires a transcoder and an IPv6-capable MTP and the available transcoder does not support IPv6, Cisco Unified Communications Manager tries to insert the IPv6-capable MTP on the leg of the call that supports IPv6 and the transcoder on the leg of the call that supports IPv4; under these circumstances, the call fails if the IP address capabilities do not match between the MTP and transcoder.

**Note**

For information on specific call scenarios where SIP trunks (and MTPs) get used, see *Deploying IPv6 in Unified Communications Networks with Cisco Unified Communications Manager 7.1(x).*

---

## SIP Trunks

If configured appropriately, SIP trunks can interact with devices that support IPv4 only, IPv6 only, or IPv4 and IPv6. Just like Cisco Unified Communications Manager and other components, the SIP trunk uses the configuration for the Enable IPv6 enterprise parameter to determine whether to support devices that use IPv6. See the following sections:

- **IPv4 or IPv6 Signaling for SIP Trunks**, page 29-14
- **IPv4 or IPv6 Media for SIP Trunks**, page 29-14
IPv4 or IPv6 Signaling for SIP Trunks

The following factors determine whether to use IPv4 or IPv6 for signaling events for SIP trunks:

- The direction of the call
- IP Addressing Mode for the SIP trunk, as configured in the Common Device Configuration window and applied to the trunk
- IP Addressing Mode Preference for Signaling configuration for the SIP trunk, as configured in the Common Device Configuration window (or Enterprise Parameter Configuration window) and applied to the trunk
- Configured Destination Address(es) for the SIP trunk

If you configure only one destination address, that is, either the Destination Address, which supports IPv4, or the Destination IPv6 Address, which supports IPv6, ensure that the IP Addressing Mode that you configure for the SIP trunk matches the IP address type that you configured for the destination address. If the configuration does not match, no call gets established over the trunk.

If you configure both the Destination Address and the Destination IPv6 Address, make sure that you configure the IP Addressing Mode as IPv4 and IPv6, so the trunk is in dual-stack mode. For a dual-stack trunk, the IP Addressing Mode Preference of Signaling configuration that you applied to the SIP trunk determines whether IPv4 or IPv6 gets used for signaling events for outgoing calls over SIP trunks.

IPv4 or IPv6 Media for SIP Trunks

The following factors determine whether to use IPv4 or IPv6 for media events for SIP trunks:

- The direction of the call
- Whether the call is an early offer or delayed offer call
- IP address preference in the SDP offer
- IP Addressing Mode for the SIP trunk, as configured in the Common Device Configuration window and applied to the trunk
- Configuration for the IP Addressing Mode Preference for Media enterprise parameter, as configured in the Enterprise Parameter Configuration window

For media negotiation for dual-stack devices, Cisco Unified Communications Manager dynamically determines the IP address to use for the call; that is, if any device on the call only supports one IP version, that IP version gets use, and an MTP that can translate IP versions gets inserted into the call. If all devices on the call support both IP versions, the configuration for the IP Addressing Mode Preference for Media enterprise parameter gets used.

- Configuration for the Enable ANAT check box (and whether ANAT is required or supported in the INVITE)
- IP Addressing Mode for the phone

Note

For information on specific call scenarios where SIP trunks (and MTPs) get used, see Deploying IPv6 in Unified Communications Networks with Cisco Unified Communications Manager 7.1(x).
TFTP Server

The TFTP server uses IPv4 to communicate with most components, such as the database, in Cisco Unified Communications Manager. If configured appropriately, however, the TFTP server can communicate with devices that use IPv4, IPv6, or both types of addresses.

Running in dual-stack mode, the TFTP server can respond to file requests from both IPv4 and IPv6 networks. For requests from IPv4 networks, the TFTP server responds by using an IPv4 stack; for requests from IPv6 networks, the TFTP server responds by using an IPv6 stack; that is, if you set the Enable IPv6 enterprise parameter to True.

IPv6 support applies to TFTP requests from devices and HTTP requests from off-cluster TFTP servers where the local TFTP server is configured as their alternate file server.

In an IPv6 network, the DHCPv6 server uses the Cisco vendor-specific DHCPv6 information options in the DHCPv6 response message to pass the TFTP IPv6 address to the device. If the device obtains an IPv6 address and sends a request to the TFTP server while the TFTP server is using IPv4 to process requests, the TFTP server does not receive the request because the TFTP server is not listening for the request on the IPv6 stack. In this case, the device cannot register with Cisco Unified Communications Manager.

For more information on the Cisco vendor-specific DHCPv6 information options, see “Cisco TFTP” in the Cisco Unified Communications Manager System Guide and Deploying IPv6 in Unified Communications Networks with Cisco Unified Communications Manager 7.1(x).

The TFTP server uses the configuration for the Enable IPv6 enterprise parameter to determine how to communicate with the phone. If you set the Enable IPv6 enterprise parameter to False, the TFTP server uses IPv4 to communicate with the phone. If you set the parameter to True, the TFTP server uses IPv4 or IPv6, depending on the IP Addressing Mode for the phone. If the configuration changes for the Enable IPv6 enterprise parameter, the TFTP server receives a change notification with the new configuration, and the TFTP server enables or disables its IPv6 capabilities without requiring you to restart the Cisco TFTP service.

The configuration file that the TFTP server serves to the phone contains the configuration for the following settings:

- IP Addressing Mode, IP Addressing Mode Preference for Signaling, and Allow Auto-Configuration for the Phone
- Host Name/IP Address (IPv4 setting) for the Cisco Unified Communications Manager server
- IPv6 Name for the Cisco Unified Communications Manager server (only if you set the Enable IPv6 enterprise parameter to True)
- IPv6 address for the CAPF server (only if you set the Enable IPv6 enterprise parameter to True and activate the Cisco Certificate Authority Proxy Function service)

If you configure IPv6 Only as the IP Addressing Mode for phones that are running SIP, the Cisco TFTP service in Cisco Unified Communications Manager overrides the IP Addressing Mode configuration and uses IPv4 Only in the configuration file.

Before the TFTP server can serve configuration files to phones that use IPv6 addresses, you must set the Enable IPv6 enterprise parameter to True. If this parameter is set to False, the TFTP server uses an IPv4 address in the configuration file, even if you configured an IP Addressing Mode of IPv6 Only for the devices.
Chapter 29      Internet Protocol Version 6 (IPv6)

System Requirements for IPv6

The following IPv6 system requirements exist for Cisco Unified Communications Manager:

- Cisco Unified Communications Manager 7.1 or later on each server in the cluster
- DHCPv6 server that can issue IPv6 addresses and DNS server that can resolve host names to IPv6 addresses; consider using Cisco Network Registrar (CNR) 6.2.
- Cisco IOS release that is compatible with Cisco Unified Communications Manager 8.5(1), and that is installed and configured on the gateways and the Cisco IOS MTP

Tip
Cisco Feature Navigator allows you to determine which Cisco IOS and Catalyst OS software images support a specific software release, feature set, or platform. To access Cisco Feature Navigator, go to http://www.cisco.com/go/cfn. You do not need a Cisco.com account to access Cisco Feature Navigator.

Interactions and Restrictions

Some Cisco Unified Communications Manager features do not work for devices with an IP Addressing Mode of IPv6 Only. Before you configure IPv6 Only for a device, review the following section, which describes Cisco Unified Communications Manager feature interactions and restrictions for IPv6.

Caution
You must enable IPv6 in the Cisco Unified Communications Operating System and set the Enable IPv6 enterprise parameter to True; if you do not perform both of these tasks, the Cisco CallManager service runs in IPv4, and phones that you configure with an IP Addressing Mode of IPv6 Only cannot register with Cisco Unified Communications Manager. After you perform these tasks, remember to restart the server. For the order of tasks that you perform for IPv6, see the “Configuration Checklist for IPv6” section on page 29-2.
You can provision your DNS server for IPv6 prior to performing an upgrade from Cisco Unified Communications Manager Release 7.0(x) to Release 8.5(1). However, do not configure the DNS records for Cisco Unified Communications Manager for IPv6 until after you upgrade to Release 8.5(1). Configuring the DNS records for Cisco Unified Communications Manager for IPv6 prior to upgrading to Release 8.5(1) causes the upgrade to fail and causes your system to become nonfunctional after you reboot.

**Annunciator**

Annunciator supports IPv4; if annunciator connects to a device with an IP Addressing Mode of IPv6 Only, Cisco Unified Communications Manager inserts an MTP that can translate IPv4 to IPv6. If no MTP that can translate IP address versions is available, no announcement plays on the phone.

**Bulk Administration Tool**

For information on how the Bulk Administration Tool (BAT) supports IPv6, see the *Cisco Unified Communications Manager Bulk Administration Guide*.

**Call Detail Records**

When IPv6 is used for a call, call detail records (CDRs) can display IPv6 addresses. For more information on CDRs, see the *Cisco Unified Communications Manager Call Detail Records Administration Guide*.

**Cisco Certificate Authority Proxy Function**

For information on how Cisco Certificate Authority Proxy Function works with IPv6, see the *Cisco Unified Communications Manager Security Guide*.

**Cisco Extension Mobility**

Cisco Extension Mobility supports IPv4, so you cannot use phones with an IP Addressing Mode of IPv6 Only for Cisco Extension Mobility. If you want to use Cisco Extension Mobility with the phone, make sure that you configure the phone with an IP Addressing Mode of IPv4 Only or IPv4 and IPv6.

**Cisco Unified Communications Manager CDR Analysis and Reporting**

For information on Cisco Unified Communications Manager CDR Analysis and Reporting, see the *Cisco Unified Communications Manager CDR Analysis and Reporting Administration Guide*.

**Cisco Unified Communications Operating System**

See the “Configuration Checklist for IPv6” section on page 29-2 and the “Running IPv6 CLI Commands or Configuring IPv6 in the Ethernet IPv6 Window” section on page 29-21.

**Cisco Unified Serviceability**

Alarms that report IPv4 addresses may also report IPv6 addresses, depending on the configuration in your network. For information on how to configure alarms and view alarm definitions in Cisco Unified Serviceability, see the *Cisco Unified Serviceability Administration Guide*.

SNMP supports IPv4, although the CISCO-CCM-MIB includes columns and storage for IPv6 addresses, preferences, and so on.

**Cisco Unity Connection and Cisco Unity**

Cisco Unity Connection and Cisco Unity communicate with Cisco Unified Communications Manager by using IPv4.
Cisco Unified Communications Manager Assistant

Cisco Unified Communications Manager Assistant does not support IPv6, so you cannot use phones with an IP Addressing Mode of IPv6 Only with Cisco Unified Communications Manager Assistant. If you want to use Cisco Unified Communications Manager Assistant with the phone, make sure that you configure the phone with an IP Addressing Mode of IPv4 Only or IPv4 and IPv6.

Real Time Monitoring Tool

In RTMT, you can monitor CTI applications, CTI devices, and CTI lines that use IPv6 addresses. When you search for the CTI application, CTI device, or CTI line, enter the IPv6 address, and check the AppIpv6Addr check box in the attribute window.

In addition, you can perform a device search on phones or SIP trunks that use IPv6 addresses. When you choose CallManager > Device Search > Open Device Search > Phones (or SIP Trunks), make sure that you specify an IPv6 address and check the IPv6Address check box in the attributes window.

Log files may display IPv4 and IPv6 addresses, depending on the configuration in your network.

In RTMT, performance monitoring counters display for the IP6 object.

Cisco Web Dialer

Cisco Web Dialer supports IPv4, so, to connect to CTI Manager, Cisco Web Dialer uses an IPv4 address. Cisco Web Dialer works with devices with an IP Addressing Mode of IPv4 and IPv6.

Conferences

Cisco Unified Communications Manager uses IPv4 for conferences, even if the conference bridge uses IPv6. During a conference, Cisco Unified Communications Manager inserts one MTP that can translate IPv4 to IPv6 for each device with an IP Addressing Mode of IPv6 Only, so each phone that uses an IPv6 address can join the conference.

For your MTP device to support security, you must configure the MTP in passthru mode, which means that the MTP does not transform the packets during the call. When you configure an MTP in passthru mode, the MTP gets the encrypted packet on one call leg and sends out the same packet on a different leg of the call. For secure conferences with secure conference bridges and encrypted devices with an IP Addressing Mode of IPv6 Only, Cisco Unified Communications Manager inserts an MTP into the conference to translate IPv4 to IPv6 (and vice versa) when some devices in the conference support IPv4.

If you configure the MTP for passthru mode, the encrypted IPv6 phones communicate with the conference bridge via SRTP. If you do not configure the MTP for passthru mode, the media gets downgraded to RTP.

Device Mobility

Device mobility supports IPv4 addresses only, so you cannot use phones with an IP Addressing Mode of IPv6 Only with device mobility.

Differentiated Services Control Point (DSCP)

Be aware that Differentiated Services Control Point (DSCP) values are the same for both IPv6 and IPv4.

Disaster Recovery System

For information on Disaster Recovery System, see the Disaster Recovery System Administration Guide.

H.323 Devices

H.323 clients, gateways, and H.225 intercluster trunks do not support IPv6. To communicate with IPv6 Only devices that connect to these gateways, Cisco Unified Communications Manager inserts an MTP that can translate IPv4 to IPv6 during a call.
Intercom
Intercom can support phones with an IP Addressing Mode of IPv4 Only or IPv4 and IPv6. During an intercom call, the talkback mode establishes media streams with the same IP version as the media stream that is used when the caller initiated intercom.

Mobile Connect and Mobile Voice Access
Cisco Unified Mobility features in Cisco Unified Communications Manager, such as Mobile Connect and Mobile Voice Access, support IPv4. On a call, when a mobile phone uses IPv4 and another phone uses IPv6, Cisco Unified Communications Manager inserts an MTP that can translate IPv4 to IPv6 into the call.

Monitoring and Recording
For monitoring and recording, the phone can handle an IPv4 media stream for customer-to-agent calls while it handles an IPv6 media stream for recording and monitoring (or vice versa).

Music On Hold
The IP Voice Media Streaming Application supports IPv4. Cisco Unified Communications Manager does not support IPv6 with multicast music on hold, so devices with an IP Addressing Mode of IPv6 Only cannot support multicast music on hold. Under these circumstances, Cisco Unified Communications Manager plays a tone, instead of music, when the phone is on hold. For IPv6 Only devices that uses unicast music on hold, Cisco Unified Communications Manager inserts an MTP that can translate IPv4 to IPv6 (or vice versa) into the media stream.

NTP Servers
To avoid potential compatibility, accuracy, and network jitter problems, ensure that the external NTP servers that you specify for the primary node are NTP v4 (version 4).

QRT
Users with phones with an IP Addressing Mode of IPv6 Only cannot report audio and other problems by pressing the QRT softkey on the phone. In addition, the QRT report does not include the streaming statistics for a phone that has an IP Addressing Mode of IPv6 Only.

RSVP
If you deploy RSVP as the call admission control mechanism in your network, do not deploy IPv6. The RSVP feature does not support IPv6. RSVP calls support IPv4. If RSVP is required for the call and any device in the call is configured for or uses an IPv6 address, Cisco Unified Communications Manager rejects the call, and the caller receives a busy tone.

SDL
SDL TCP connections support IPv6, but SDL links support IPv4. If you configure a host name in the Server Configuration window in Cisco Unified Communications Manager Administration, SDL queries the DNS A record, which ensures that IPv4 is used. If you specify an IP address, an IPv4 address gets passed down to the SDL layer.

Security (TLS and SRTP)
For information on how TLS and SRTP work with IPv6, see the Cisco Unified Communications Manager Security Guide.
SIP Phones and TFTP
Phones that run SIP do not support IPv6 addresses. If you configure IPv6 Only as the IP Addressing Mode for a phone that runs SIP, the Cisco TFTP service overrides the IP Addressing Mode configuration and uses IPv4 Only in the configuration file.

T.38 Fax
Whether a T.38 fax call uses IPv4 or IPv6 depends on the preference of Cisco Unified Communications Manager and the capabilities of the devices in the call. If one device in the call uses IPv6 and the other device can use IPv4 and IPv6, the call uses IPv6, regardless of the configuration for the signaling and media enterprise parameters in Cisco Unified Communications Manager Administration.

Cisco Unified Communications Manager supports the following types of T.38 fax calls:

- SIP-to-SIP call that uses IPv6
- SIP-to-SIP call that uses IPv4
- SIP-to-non-SIP call that uses IPv4
- SIP-to-non-SIP call where the SIP device uses IPv6 and the non-SIP device uses IPv4 with an MTP that can translate IP address versions

During the middle of a T.38 fax call, Cisco Unified Communications Manager does not insert an MTP that converts the IP version types; the MTP must already exist in the call.

Transfer
The transfer components in Cisco Unified Communications Manager uses the IP Addressing Mode and the IP address of the device to determine how to handle the transfer. If the IP capabilities do not match when you transfer a call, Cisco Unified Communications Manager allocates an MTP that can translate IP version, so the transfer can occur.

Web Browser on the Phone
On the Cisco Unified IP Phone, the HTTP interface for the web browser supports IPv4 addresses, so the phone does not allow web access to servers that use an IPv6 address.

Video
Cisco Unified Communications Manager supports video IPv6 calls in the following cases:

- Cisco Unified Video Advantage does not support IPv6, so, when the media preference is IPv6, video uses IPv4.
- The audio and video portions of a call negotiate the same IP type for the initial call; that is, if two dual-stack phones are in a call that uses both audio and video, the call uses IPv4 for both the audio and video portions of the initial call, even when the media preference is IPv6.
- If two dual-stack phones negotiate IPv6 for the audio call based on the media preference and then you add video mid-call, the video portion of the call uses IPv4, even if the media preference is IPv6.
- MTPs do not get allocated for video support. For example, a call occurs between two dual-stack phones over a SIP trunk with an IP Addressing Mode of IPv6 Only; IPv6 gets negotiated for the audio portion of the call, and video cannot occur because the video device does not support IPv6. No MTP gets allocated to support the video portion of the call.
Installing and Activating IPv6

After you install Cisco Unified Communications Manager 7.1, your network can support IPv6 if you perform the necessary configuration tasks. For information on configuration tasks that you must perform, see the “Configuration Checklist for IPv6” section on page 29-2.

IPv6 impacts the Cisco CallManager, CTIManager, and Certificate Authority Proxy Function services in Cisco Unified Serviceability. Depending on the configuration tasks that you perform in Cisco Unified Communications Manager Administration, you may need to restart these services after you configure IPv6.

Configuring IPv6

This section contains information on the following topics:

- Running IPv6 CLI Commands or Configuring IPv6 in the Ethernet IPv6 Window, page 29-21
- Configuring Service and Enterprise Parameters for IPv6, page 29-25
- Accessing IPv6 and IPv4 Configuration Settings in Cisco Unified Communications Manager Administration, page 29-27

Tip

Before you configure IPv6, review the “Configuration Checklist for IPv6” section on page 29-2.

Running IPv6 CLI Commands or Configuring IPv6 in the Ethernet IPv6 Window

To enable IPv6 in the Cisco Unified Communications Operating System and to ensure that the Cisco Unified Communications Manager server gets an IPv6 address, you must perform one of the following tasks:

- Run the IPv6 CLI commands in the command line interface.
- Enable IPv6 and configure the IPv6 address in the Ethernet IPv6 window in the Cisco Unified Communications Operating System.

Caution

Before you set the Enable IPv6 enterprise parameter to True in Cisco Unified Communications Manager Administration, perform the following procedure. If you set the enterprise parameter to True before you enable IPv6 in the Cisco Unified Communications Operating System, the Cisco CallManager service runs in IPv4, and phones that have IP Addressing Mode of IPv6 Only cannot register with Cisco Unified Communications Manager.

Table 29-2 provides a description of the Ethernet IPv6 configuration settings and the equivalent CLI commands that support the graphical user interface (GUI) options.

Procedure

Step 1

In Cisco Unified Communications Operating System, choose Settings > IP > Ethernet IPv6. The Ethernet IPv6 Configuration window displays.
To modify the Ethernet settings, enter the values in the appropriate fields. For a description of the fields on the Ethernet IPv6 Configuration window, see Table 29-2.

Check the **Update with Reboot** check box. For the IPv6 settings in this window to take effect, you must reboot the server.

Click **Save**. The server reboots immediately after you click Save.

Perform this procedure for each server in the cluster.

### Table 29-2 IPv6 CLI Commands and Ethernet IPv6 Configuration Settings

<table>
<thead>
<tr>
<th>Configuration Setting in Ethernet IPv6 Window</th>
<th>Equivalent CLI Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enable IPv6 check box</td>
<td>set network ipv6 service enable</td>
<td>These settings enable IPv6 in the Cisco Unified Communications Operating System.</td>
</tr>
</tbody>
</table>

**Caution**

For IPv6 to work, you must either check the Ethernet IPv6 check box or issue the equivalent CLI command. You must perform this task before you set the Enable IPv6 enterprise parameter to True.
Table 29-2  IPv6 CLI Commands and Ethernet IPv6 Configuration Settings (continued)

<table>
<thead>
<tr>
<th>Configuration Setting in Ethernet IPv6 Window</th>
<th>Equivalent CLI Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Router Advertisement radio button</td>
<td>Not applicable</td>
<td>If you want to use stateless address autoconfiguration to obtain a non-link-local IPv6 address for the Cisco Unified Communications Manager server, click the Router Advertisement radio button. Ensure that the Cisco Unified Communications Manager server only obtains one non-link-local IPv6 address. If the server has more than one IPv6 address, Cisco Unified Communications Manager may not behave as expected. If the Cisco Unified Communications Manager server obtains an IPv6 address via stateless address autoconfiguration and you also have a static IPv6 address that is configured for the server, Cisco Unified Communications Manager ignores the IPv6 address that is obtained via stateless address autoconfiguration and uses the static address.</td>
</tr>
<tr>
<td>DHCP radio button</td>
<td>set network ipv6 dhcp enable</td>
<td>If you want the DHCPv6 server to issue a non-link-local IPv6 address to the Cisco Unified Communications Manager server, click the DHCP radio button or issue the equivalent CLI command. Ensure that the Cisco Unified Communications Manager server only obtains one non-link-local IPv6 address. If the server has more than one IPv6 address, Cisco Unified Communications Manager may not behave as expected.</td>
</tr>
</tbody>
</table>
Configuring IPv6

Tip

If you decide to run the CLI commands that are described in Table 29-2 instead of configure the Ethernet IPv6 settings in the Cisco Unified Communications Operating System, you must reboot the server for the changes to take effect. For information on how to run CLI commands and for other IPv6 CLI commands, see the Command Line Interface Reference Guide for Cisco Unified Communications Solutions.

<table>
<thead>
<tr>
<th>Configuration Setting in Ethernet IPv6 Window</th>
<th>Equivalent CLI Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manual Entry radio button, IPv6 Address, Subnet Mask</td>
<td>set network ipv6 static_address &lt;addr&gt; &lt;mask&gt;</td>
<td>These Ethernet IPv6 settings and equivalent CLI command allow you to configure a static IPv6 address for the Cisco Unified Communications Manager server. Configuring a static non-link-local IPv6 address assumes that you do not want the Cisco Unified Communications Manager server to get the IPv6 address from the DHCPv6 server or via stateless address autoconfiguration.</td>
</tr>
<tr>
<td>IPv6 Address</td>
<td>show network ipv6 settings</td>
<td>These settings allow you to view the IPv6 address for the Cisco Unified Communications Manager server.</td>
</tr>
</tbody>
</table>

Table 29-2 IPv6 CLI Commands and Ethernet IPv6 Configuration Settings (continued)
Configuring Service and Enterprise Parameters for IPv6

Table 29-3 describes the enterprise and service parameters that you can configure for IPv6. To configure enterprise parameters in Cisco Unified Communications Manager Administration, choose System > Enterprise Parameters. To configure service parameters in Cisco Unified Communications Manager Administration, choose System > Service Parameters.

Tip
For a step-by-step procedure on how to configure enterprise parameters, see the “Enterprise Parameter Configuration” chapter in the Cisco Unified Communications Manager Administration Guide. For a step-by-step procedure on how to configure service parameters, see the “Service Parameter Configuration” in the Cisco Unified Communications Manager Administration Guide.

Table 29-3  Enterprise and Service Parameters for IPv6

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enable IPv6</td>
<td>This enterprise parameter specifies whether Cisco Unified Communications Manager can negotiate calls by using IPv6 and whether phones can advertise an IPv6 address. Before you set this parameter to True, make sure that you enabled IPv6 in the Cisco Unified Communications Operating System on all servers in the cluster. Setting this parameter to True causes the Cisco CallManager service to run in dual-stack mode, which is required for interacting with devices that support IPv6. The default value equals False, which means that Cisco Unified Communications Manager cannot negotiate calls by using IPv6 and phones cannot advertise an IPv6 address. After you update this enterprise parameter, restart the Cisco CallManager, CTIManager, and the Certificate Authority Proxy Function services in Cisco Unified Serviceability.</td>
</tr>
<tr>
<td>IP Addressing Mode Preference for Media</td>
<td>This enterprise parameter, which applies only to dual-stack devices, specifies the addressing mode that Cisco Unified Communications Manager uses for media events when both IPv4 and IPv6 addresses are available from each device on the call. The default value equals Prefer IPv4.</td>
</tr>
<tr>
<td>IP Addressing Mode Preference for Signaling</td>
<td>This enterprise parameter, which applies only to dual-stack devices, specifies how the dual-stack phone connects to Cisco Unified Communications Manager for signaling events and how the dual-stack SIP trunk connects to the peer device for signaling events. The default value equals Prefer IPv4.</td>
</tr>
<tr>
<td>Allow Auto-Configuration for Phones</td>
<td>This parameter determines whether the phone is allowed to obtain an address through stateless autoconfiguration. Valid values specify On (the phone obtains its address as specified by the router advertisements, which may be stateless or stateful, depending on the router configuration) or Off (the phone always uses DHCPv6 to obtain its IPv6 address).</td>
</tr>
</tbody>
</table>
Chapter 29      Internet Protocol Version 6 (IPv6)

Configuring IPv6

Call Counting CAC Enabled

This service parameter, which supports the Cisco CallManager service, determines whether Cisco Unified Communications Manager uses call counting as part of the locations-based call admission control (CAC) feature. Call counting uses a fixed bandwidth value to reserve and adjust bandwidth per call, regardless of the codec or media payload or the Internet Protocol Version (IPv6 or IPv4) that is used for each call. Call counting may potentially oversubscribe or undersubscribe bandwidth because a fixed-value bandwidth gets reserved per call no matter what the actual bandwidth is for the call. Cisco recommends you leave this parameter set to the default value of False (disabled) unless your network requires the call counting feature. To enable call counting for CAC, choose True for the parameter; to disable call counting for CAC, choose False.

This service parameter applies to IPv4 and IPv6 calls.

Audio Bandwidth For Call Counting CAC

This service parameter, which supports the Cisco CallManager service, specifies the amount of bandwidth to deduct from the available bandwidth for audio calls after you set the Call Counting CAC Enabled parameter to True. For each audio call, the amount of bandwidth that you enter in this field gets deducted, regardless whether more or less bandwidth is actually used for the call.

This service parameter applies to IPv4 and IPv6 calls.

Video Bandwidth For Call Counting CAC

This service parameter, which supports the Cisco CallManager service, specifies the units of bandwidth to deduct from the available bandwidth for video calls after you set the Call Counting CAC Enabled parameter to True. For each video call, the available bandwidth gets reduced by the number of units that are required to account for the actual bandwidth usage. For example, if you specify 512 kb/s as the bandwidth unit in this parameter, and a video call utilizes 384 kb/s, then one unit, 512 kb/s, gets deducted from available bandwidth. Likewise, if you specify 512 kb/s in this parameter and a video call negotiated 768 kb/s, then two units of bandwidth (1064 kb/s) get deducted from the available bandwidth.

This service parameter applies to IPv4 and IPv6 calls.

Alternate Cisco File Server(s)

These service parameters, which support the Cisco TFTP service, allow you to configure alternate Cisco file servers, which are TFTP servers that are on a different cluster. These parameters, which support either IPv4 or IPv6 addresses or host names that resolve to an IP address, determine the IP stack that the TFTP uses to communicate between primary and alternate file servers. If an alternate file server supports dual-stack mode and you want to set both IPv4 and IPv6 addresses for the same server in these parameter fields, you must add both IP addresses, one per field, and the TFTP server tries each address in the order that you configure.

Table 29-3  Enterprise and Service Parameters for IPv6 (continued)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Call Counting CAC Enabled</td>
<td>This service parameter, which supports the Cisco CallManager service, determines whether Cisco Unified Communications Manager uses call counting as part of the locations-based call admission control (CAC) feature. Call counting uses a fixed bandwidth value to reserve and adjust bandwidth per call, regardless of the codec or media payload or the Internet Protocol Version (IPv6 or IPv4) that is used for each call. Call counting may potentially oversubscribe or undersubscribe bandwidth because a fixed-value bandwidth gets reserved per call no matter what the actual bandwidth is for the call. Cisco recommends you leave this parameter set to the default value of False (disabled) unless your network requires the call counting feature. To enable call counting for CAC, choose True for the parameter; to disable call counting for CAC, choose False. This service parameter applies to IPv4 and IPv6 calls.</td>
</tr>
<tr>
<td>Audio Bandwidth For Call Counting CAC</td>
<td>This service parameter, which supports the Cisco CallManager service, specifies the amount of bandwidth to deduct from the available bandwidth for audio calls after you set the Call Counting CAC Enabled parameter to True. For each audio call, the amount of bandwidth that you enter in this field gets deducted, regardless whether more or less bandwidth is actually used for the call. This service parameter applies to IPv4 and IPv6 calls.</td>
</tr>
<tr>
<td>Video Bandwidth For Call Counting CAC</td>
<td>This service parameter, which supports the Cisco CallManager service, specifies the units of bandwidth to deduct from the available bandwidth for video calls after you set the Call Counting CAC Enabled parameter to True. For each video call, the available bandwidth gets reduced by the number of units that are required to account for the actual bandwidth usage. For example, if you specify 512 kb/s as the bandwidth unit in this parameter, and a video call utilizes 384 kb/s, then one unit, 512 kb/s, gets deducted from available bandwidth. Likewise, if you specify 512 kb/s in this parameter and a video call negotiated 768 kb/s, then two units of bandwidth (1064 kb/s) get deducted from the available bandwidth. This service parameter applies to IPv4 and IPv6 calls.</td>
</tr>
<tr>
<td>Alternate Cisco File Server(s)</td>
<td>These service parameters, which support the Cisco TFTP service, allow you to configure alternate Cisco file servers, which are TFTP servers that are on a different cluster. These parameters, which support either IPv4 or IPv6 addresses or host names that resolve to an IP address, determine the IP stack that the TFTP uses to communicate between primary and alternate file servers. If an alternate file server supports dual-stack mode and you want to set both IPv4 and IPv6 addresses for the same server in these parameter fields, you must add both IP addresses, one per field, and the TFTP server tries each address in the order that you configure.</td>
</tr>
</tbody>
</table>
Accessing IPv6 and IPv4 Configuration Settings in Cisco Unified Communications Manager Administration

Table 29-4 describes the IPv6 and IPv4 settings that are in Cisco Unified Communications Manager Administration, except for IPv6 service and enterprise parameters, which are described in Table 29-3. For some IPv6 settings in Table 29-4, equivalent settings for IPv4 display in Cisco Unified Communications Manager Administration; for example, in the SIP Trunk Configuration window, you can configure the Destination Address IPv6 setting or the Destination Address setting, or both settings, depending on the IP support in your network.

For related configuration procedures, see the following sections:

- Configuring Service and Enterprise Parameters for IPv6, page 29-25
- Server Configuration Settings, Cisco Unified Communications Manager Administration Guide
- SIP Route Pattern Configuration Settings, Cisco Unified Communications Manager Administration Guide
- Common Device Configuration Settings, Cisco Unified Communications Manager Administration Guide
- Configuring a Trunk, Cisco Unified Communications Manager Administration Guide

### Table 29-4 IPv6 Settings in Cisco Unified Communications Manager Administration

<table>
<thead>
<tr>
<th>Configuration Setting</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>System &gt; Server</td>
<td></td>
</tr>
<tr>
<td>Host Name/IP Address</td>
<td>This field supports IPv4. If your network uses DNS that can map to IPv4 addresses, you can enter the host name of the Cisco Unified Communications Manager server. Otherwise, you must enter the full IPv4 address of the server.</td>
</tr>
</tbody>
</table>

**Tip** If your network supports IPv6 (or IPv4 and IPv6), configure the IPv6 Name field in addition to the Host Name/IP Address field.
**Table 29-4  IPv6 Settings in Cisco Unified Communications Manager Administration (continued)**

<table>
<thead>
<tr>
<th>Configuration Setting</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>IPv6 Name</td>
<td>This field supports IPv6. If your network uses DNS that can map to IPv6 addresses, you can enter the host name of the Cisco Unified Communications Manager server. Otherwise, enter the non-link-local IP address of the Cisco Unified Communications Manager server; for information on how to obtain the non-link-local IP address, see the “Running IPv6 CLI Commands or Configuring IPv6 in the Ethernet IPv6 Window” section on page 29-21. Phones that run SCCP use this field, which gets included in the TFTP configuration file, to retrieve the IPv6 address of the Cisco Unified Communications Manager server, so phone registration occurs. <strong>Tip</strong> You can provision your DNS server for IPv6 prior to upgrading from Cisco Unified Communications Manager Release 7.0(x) to Release 8.5(1). However, do not configure the DNS records for Cisco Unified Communications Manager for IPv6 until after you upgrade to Release 8.5(1). Configuring the DNS records for Cisco Unified Communications Manager for IPv6 prior to upgrading to Release 8.5(1) causes the upgrade to fail and causes your system to become nonfunctional after you reboot. <strong>Tip</strong> In addition to configuring the IPv6 Name field, you must configure the Host Name/IP Address field, so Cisco Unified Communications Manager can support features/devices that use IPv4 (or IPv4 and IPv6).</td>
</tr>
</tbody>
</table>

**Call Routing > SIP Route Patterns**

<table>
<thead>
<tr>
<th>Configuration Setting</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>IPv4 Pattern</strong></td>
<td>Enter the domain, sub-domain, IPv4 address or IP subnetwork address. <strong>Tip</strong> For the IP subnetwork address, in Classless Inter-Domain Routing (CIDR) notation, enter X.X.X.X/Y, where Y equals the network prefix that denotes the number of bits in the address that will be the network address. <strong>Tip</strong> If the SIP trunk supports IPv6 or both IPv4 and IPv6 (dual-stack mode), configure the IPv6 Pattern in addition to the IPv4 pattern.</td>
</tr>
<tr>
<td><strong>IPv6 Pattern</strong></td>
<td>Cisco Unified Communications Manager uses SIP route patterns to route or block both internal and external calls. The IPv6 address in this field provides the basis for routing internal and external calls to SIP trunks that support IPv6. <strong>Tip</strong> If the SIP trunk supports both IPv4 and IPv6, configure the IPv4 Pattern in addition to the IPv6 Pattern.</td>
</tr>
</tbody>
</table>
Cisco Unified Communications Manager Features and Services Guide for Cisco Unified Communications Manager

Chapter 29      Internet Protocol Version 6 (IPv6)

Configuring IPv6

Device > Device Settings > Common Device Configuration

IP Addressing Mode

Choose the version of IP address that the device (SIP trunk or phone that runs SCCP) uses to connect to Cisco Unified Communications Manager. From the drop-down list box, choose one of the following options:

- IPv4 Only—For both media and signaling events, the device uses an IPv4 address to connect to Cisco Unified Communications Manager. If an IPv4 address is not available for the device, the call fails.

  If you choose this option, the phone releases an IPv6 address. If you choose this option, the SIP trunk uses an IPv4 address to connect to the peer device.

- IPv6 Only—For both media and signaling events, the device uses an IPv6 address to connect to Cisco Unified Communications Manager. If an IPv6 address is not available for the device, the call fails.

  If you choose this option, the phone releases an IPv6 address. If you choose this option, the SIP trunk uses an IPv6 address to connect to the peer device.

Phones that run SIP do not support IPv6, so do not choose this option for these phones. If you configure IPv6 Only as the IP Addressing Mode for phones that run SIP, the Cisco TFTP service overrides the IP Addressing Mode configuration and uses IPv4 Only in the configuration file.

- IPv4 and IPv6 (Default)—Choose this option for dual-stack devices, which can have both an IPv4 and IPv6 address. For both media and signaling events, the dual-stack device uses either an IPv4 or an IPv6 address to connect to Cisco Unified Communications Manager.

  If only an IPv4 or IPv6 is available for a device (not both types of IP addresses), the device uses the available IP address to negotiate the call. If the device has both IP address types for both signaling and media events, Cisco Unified Communications Manager uses the configuration for IP Addressing Mode Preference for Signaling setting for signaling events and the IP Addressing Mode Preference for Media enterprise parameter for media events.

IP Addressing Mode Preference for Signaling

For dual-stack phones, which support both IPv4 and IPv6 addresses, choose the version of IP address that the phone prefers to establish a connection to Cisco Unified Communications Manager during a signaling event. For dual-stack SIP trunks, choose the version of IP address that the SIP trunk uses to connect to the peer device for signaling events.

From the drop-down list box, choose one of the following options:

- IPv4—The dual-stack device prefers to establish a connection via an IPv4 address during a signaling event.

- IPv6—The dual-stack device prefers to establish a connection via an IPv6 address during a signaling event.

- Use System Default—The configuration for the enterprise parameter, IP Addressing Mode Preference for Signaling, applies.
Allow Auto-Configuration for Phones

This drop-down list box supports IPv6 for dual-stack Cisco Unified IP Phones that run SCCP. From the drop-down list box, choose one of the following options:

- **On**—Depending on how the M bit is set via stateless address autoconfiguration on the router, the phone is allowed to use the IPv6 Network ID that is advertised in the Router Advertisements (RAs) to autoconfigure its IPv6 address.

  Phones also require a TFTP server address to register with Cisco Unified Communications Manager. You can manually configure the TFTP server address via the interface on the phone, or you can obtain it from a DHCPv6 server.

  **Tip** To indicate to the phone that it needs to use the DHCPv6 server to obtain other information, ensure that the O bit is set via stateless address autoconfiguration on the router.

- **Off**—The phone obtains its IPv6 address and TFTP server address from the DHCPv6 server.

- **Default**—To use the configuration for the Allow Auto-Configuration for Phones enterprise parameter, choose this option.

Although Cisco Unified Communications Manager does not use this configuration, the TFTP file that the phone obtains includes this information.

### Device > SIP Trunk

<table>
<thead>
<tr>
<th>Configuration Setting</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Destination Address</td>
<td>The Destination Address, which supports IPv4, represents the remote SIP peer with which this trunk will communicate. The allowed values for this field specify a valid V4 dotted IP address, fully qualified domain name (FQDN), or DNS SRV record only if the Destination Address is an SRV field is checked. SIP trunks only accept incoming requests from the configured Destination Address and the specified incoming port that is specified in the SIP Trunk Security Profile that is associated with this trunk. If the remote end is a Cisco Unified Communications Manager cluster, DNS SRV represents the recommended choice for this field. The DNS SRV record should include all Cisco Unified Communications Managers within the cluster. <strong>Tip</strong> For SIP trunks that can support IPv6 or IPv6 and IPv4 (dual-stack mode), configure the Destination Address IPv6 field in addition to the Destination Address field.</td>
</tr>
</tbody>
</table>
### Table 29-4 IPv6 Settings in Cisco Unified Communications Manager Administration (continued)

<table>
<thead>
<tr>
<th>Configuration Setting</th>
<th>Description</th>
</tr>
</thead>
</table>
| Destination Address IPv6 | The Destination IPv6 Address represents the remote SIP peer with which this trunk will communicate. Enter one for the following values in the field:  
  - A valid IPv6 address (global unicast, unique local, or a host name)  
  - A fully qualified domain name (FQDN)  
  - A DNS SRV record, but only if you check the Destination Address is an SRV check box.  
SIP trunks only accept incoming requests from the configured Destination IPv6 Address and the specified incoming port that is specified in the SIP Trunk Security Profile that is associated with this trunk.  
If the remote end is a Cisco Unified Communications Manager cluster, consider entering the DNS SRV record in this field. The DNS SRV record should include all Cisco Unified Communications Managers within the cluster.  
**Tip** For SIP trunks that run in dual-stack mode or that support an IP Addressing Mode of IPv6 Only, configure this field. If the SIP trunk runs in dual-stack mode, you must also configure the Destination Address field. |

**Device > Device Settings > SIP Profile**

| Enable ANAT | This option allows a dual-stack SIP trunk to offer both IPv4 and IPv6 media.  
When you check both the Enable ANAT and the Media Termination Point Required check boxes, Cisco Unified Communications Manager inserts a dual-stack MTP and sends out an offer with two m-lines, one for IPv4 and another for IPv6. If a dual-stack MTP cannot be allocated, Cisco Unified Communications Manager sends an INVITE without SDP.  
When you check the Enable ANAT check box and the Media Termination Point Required check box is unchecked, Cisco Unified Communications Manager sends an INVITE without SDP.  
When both the Enable ANAT and Media Termination Point Required check boxes display as unchecked (or when an MTP cannot be allocated), Cisco Unified Communications Manager sends an INVITE without SDP.  
When you uncheck the Enable ANAT check box but you check the Media Termination Point Required check box, consider the information, which assumes that an MTP can be allocated:  
  - Cisco Unified Communications Manager sends an IPv4 address in the SDP for SIP trunks with an IP Addressing Mode of IPv4 Only.  
  - Cisco Unified Communications Manager sends an IPv6 address in the SDP for SIP trunks with an IP Addressing Mode of IPv6 Only.  
  - For dual-stack SIP trunks, Cisco Unified Communications Manager determines which IP address type to send in the SDP based on the configuration for the IP Addressing Mode Preference for Media enterprise parameter. |
Providing Information to End Users

No special considerations exist for phone (end) users, although IPv6 menu options display on the phone. Be aware, though, that if you do not configure the IP address support correctly in your network, users may receive a busy tone, dead air, and so on, when trying to place or answer calls on the phone.

Tip

For additional information on using IPv6 with your phone, see the *Cisco Unified IP Phone Administration Guide* that supports your phone model and this version of Cisco Unified Communications Manager.

Troubleshooting IPv6

For information on troubleshooting IPv6, see the *Cisco Unified Communications Manager Troubleshooting Guide*.

Related Topics

- Configuration Checklist for IPv6, page 29-2
- Introducing IPv6 for Cisco Unified Communications Manager, page 29-5
- Running IPv6 CLI Commands or Configuring IPv6 in the Ethernet IPv6 Window, page 29-21
- Configuring Service and Enterprise Parameters for IPv6, page 29-25
- Accessing IPv6 and IPv4 Configuration Settings in Cisco Unified Communications Manager Administration, page 29-27
- Server Configuration Settings, *Cisco Unified Communications Manager Administration Guide*
- Enterprise Parameter Configuration, *Cisco Unified Communications Manager Administration Guide*
- Service Parameter Configuration, *Cisco Unified Communications Manager Administration Guide*
- Cisco IOS Media Termination Point Configuration Settings, *Cisco Unified Communications Manager Administration Guide*
- SIP Route Pattern Configuration Settings, *Cisco Unified Communications Manager Administration Guide*
- Configuring a Trunk, *Cisco Unified Communications Manager Administration Guide*
- Common Device Configuration Settings, *Cisco Unified Communications Manager Administration Guide*
- Cisco TFTP, *Cisco Unified Communications Manager System Guide*

Additional Cisco Documentation

- *Deploying IPv6 in Unified Communications Networks with Cisco Unified Communications Manager 7.1(x)*
- *Cisco Unified IP Phone Administration Guide*
- *Cisco IOS IPv6 Configuration Library*
- *Implementing VoIP for IPv6*
• Cisco Network Registrar User's Guide, 6.2
• Cisco Unified Communications Manager Administration Guide
• Cisco Unified Serviceability Administration Guide
• Cisco Unified Communications Manager Call Detail Records Administration Guide
• Cisco Unified Communications Manager Cisco Unified Communications Manager CDR Analysis and Reporting Administration Guide
• Cisco Unified Communications Operating System Administration Guide
• Cisco Unified Communications Manager Bulk Administration Guide
• Cisco Unified Communications Manager Security Guide
• Troubleshooting Guide for Cisco Unified Communications Manager