



# Cisco TAPI Installation Guide for Cisco Unified CallManager 4.2(3)

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This document describes how to install and configure the Cisco Telephony Application Programming Interface (TAPI) client software for Cisco Unified CallManager 4.2(3).

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# Introduction

The Cisco TAPI Service Provider (Cisco Unified CallManager TSP) allows developers to create customized IP telephony applications for Cisco users; for example, voice mail with other TAPI-compliant systems, automatic call distribution (ACD), and caller ID screen pops. Cisco Unified CallManager TSP enables the Cisco Unified Communications system (Cisco Unified CallManager) to understand commands from a user-level TAPI application.

The Cisco TAPI solution allows you to install multiple Cisco TAPI Service Providers (TSPs) on the same machine. This configuration allows TAPI applications to increase the number of lines that can be supported and to increase the amount of call traffic. Configure each Cisco Unified CallManager TSP with a different username and password that is administered in the Cisco Unified CallManager Directory. Configure each user in the Directory, so no two users are associated to the same device. TSPs in the multiple TSP system do not communicate with each other and create a separate computer telephony integration (CTI) connection to the Cisco Unified CallManager.

**Note**

If you have upgraded to Cisco Unified CallManager 4.2, you must upgrade the TAPI client software on any application server or client workstation on which TAPI applications are installed. If you do not upgrade the TAPI client, your application will fail to initialize. If you need to upgrade, download the appropriate client from the Cisco Unified CallManager Administration as described in the [“Installing the Cisco Unified CallManager TSP”](#) section. The upgraded TAPI client software does not work with older releases of Cisco Unified CallManager.

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# Installing the Cisco Unified CallManager TSP

Install the Cisco Unified CallManager TSP software either directly from the Cisco Unified CallManager CD-ROM or from Cisco Unified CallManager Administration. For information on installing plugins from the Cisco Unified CallManager, see the *Cisco Unified CallManager Administration Guide*.

To install the Cisco Unified CallManager TSP from the Cisco Unified CallManager CD-ROM, perform the following steps.

**Note**

If you install Cisco Unified CallManager TSP 4.2 on a system that contains Cisco CallManager TSP 3.0, the installation program deletes the TSP 3.0 version and installs TSP 4.2. If you install Cisco Unified CallManager TSP 4.2 on a system that contains Cisco CallManager TSP 3.1, Cisco CallManager TSP 3.2, or Cisco CallManager TSP 3.3, the installation program upgrades the TSPs to TSP 4.2. (For more details, see the [“Managing the Cisco Unified CallManager TSP”](#) section.)

The installation wizard varies depending on whether you have a previous version of Cisco Unified CallManager TSP installed.

**Note**

Installing multiple TSPs installs multiple CiscoTSPXXX.tsp and CiscoTUIISPXXX.dll files in the same Windows system directory.

**Procedure**

- Step 1** Insert the Cisco Unified CallManager CD-ROM.
- Step 2** Double-click **My Computer**.
- Step 3** Double-click the CD-ROM drive.
- Step 4** Double-click the **Installs** folder.
- Step 5** Double-click **Cisco TSP.exe**.
- Step 6** Follow the online instructions.

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### Next Steps

Install the Cisco wave driver if you plan to use first-party call control. (Do this even if you are performing your own media termination.) For more information, see the [“Installing the Wave Driver”](#) section.

# Activating the Cisco Unified CallManager TSP

You can install up to 10 TSPs on a computer. Use the following procedure to activate each of these TSPs. When you install a Cisco Unified CallManager TSP, you add it to the set of active TAPI service providers. The TSP displays as CiscoTSPXXX, where X is between 001 and 010. If a TSP has been removed or if some problem has occurred, you can manually add it to this set.

To manually add the Cisco Unified CallManager TSP to the list of telephony drivers, perform the following steps.

### Procedure for Windows 2000 and Windows XP

- 
- Step 1** Open the Control Panel.
  - Step 2** Double-click **Phone and Modem Options**.
  - Step 3** On the Phone and Modem Options dialog box, click the **Advanced** tab.




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**Note** If the Cisco Unified CallManager TSP is either not there or you removed it previously and want to add it now, you can do so from this window.

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- Step 4** Click **Add**.
  - Step 5** On the Add Provider dialog box, choose the appropriate TSP. Labels identify the TSPs in the Telephony providers window as CiscoTSPXXX, where XXX is between 001 and 010.
  - Step 6** Click **Add**.  
The TSP that you chose displays in the provider list in the Phone and Modem Options window.
  - Step 7** Configure the Cisco Unified CallManager TSP as described in [“Configuring the Cisco Unified CallManager TSP”](#) or click **Close** to complete the setup.
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### Procedure for Windows NT, Windows 98, and Windows 95

- 
- Step 1** Open the Control Panel.
  - Step 2** Double-click **Telephony**.
  - Step 3** Click the **Telephony Drivers** tab.



**Note** If the Cisco Unified CallManager TSP is either not there or you removed it previously and want to add it now, you can do so from this window.

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- Step 4** Click **Add**.
  - Step 5** On the Add Provider dialog box, choose the appropriate TSP. Labels identify the TSPs in the Telephony providers window as CiscoTSPXXX, where XXX is between 001 and 010.
  - Step 6** Click **Add**.  
The Provider list in the Telephony Drivers window now includes the CiscoTSPXXX range 001 - 010.
  - Step 7** Configure the Cisco Unified CallManager TSP as described in [“Configuring the Cisco Unified CallManager TSP”](#) or click **Close** to complete the setup.
- 

## Configuring the Cisco Unified CallManager TSP

You configure the Cisco Unified CallManager TSP by setting parameters in the Cisco IP-PBX Service Provider configuration window. Perform the following steps to configure Cisco Unified CallManager TSP.

### Procedure for Windows 2000 and Windows XP

- 
- Step 1** Open the Control Panel.
  - Step 2** Double-click **Phone and Modem Options**.
  - Step 3** Choose the Cisco Unified CallManager TSP that you want to configure.

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**Step 4** Click **Configure**.

The system displays the Cisco IP PBX Service Provider dialog box.

**Step 5** Enter the appropriate settings as described in the “[Cisco Unified CallManager TSP Configuration Settings](#)” section.

**Step 6** Click **OK** to save changes.



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**Note** After the TSP is configured, you must restart the telephony service before an application can run and connect with its devices.

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### Procedure for Windows NT, Windows 98, and Windows 95

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**Step 1** Open the Control Panel.

**Step 2** Double-click **Telephony**.

**Step 3** Choose the Cisco Unified CallManager TSP that you want to configure.

**Step 4** Click **Configure**.

The system displays the Cisco IP PBX Service Provider dialog box.

**Step 5** Enter the appropriate settings as described in the “[Cisco Unified CallManager TSP Configuration Settings](#)” section.

**Step 6** Click **OK** to save changes.



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**Note** After configuring the TSP, you must restart the telephony service before an application can run and connect with its devices.

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# Cisco Unified CallManager TSP Configuration Settings

The following sections describe the fields in the Cisco-IP PBX Service Provider dialog box:

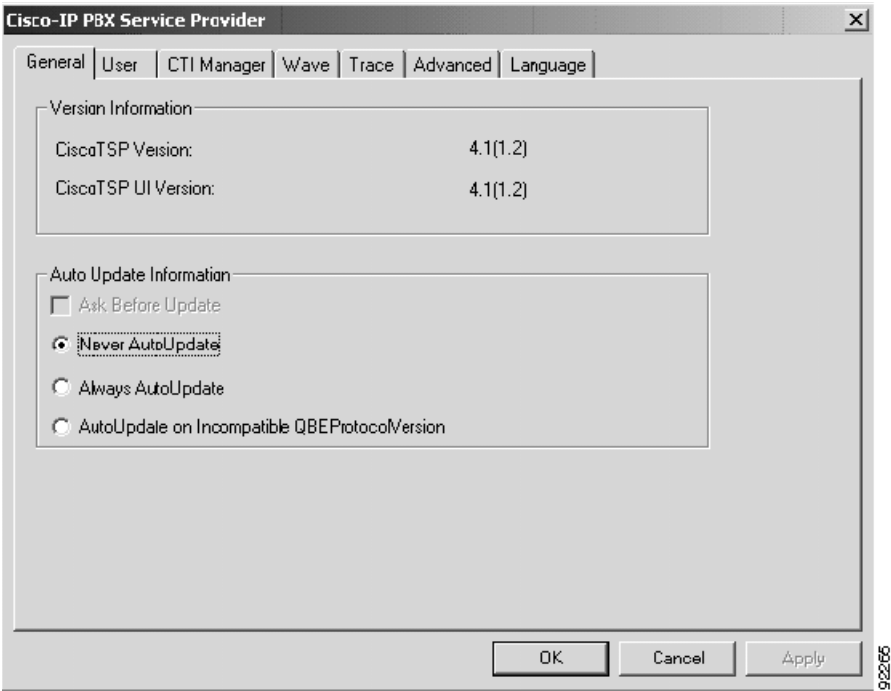
- [General Tab](#)
- [User Tab](#)
- [CTI Manager Tab](#)
- [Wave Tab](#)
- [Trace Tab](#)
- [Advanced Tab](#)
- [Language Tab](#)

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# General Tab

The General Tab displays TSP and TSPUI version information, as illustrated in [Figure 1](#).

**Figure 1** Cisco IP PBX Service Provider General Tab



[Table 1](#) contains a list of the General tab fields that must be set and their descriptions.

**LIMITED AVAILABILITY****Table 1 Auto Update Information Fields**

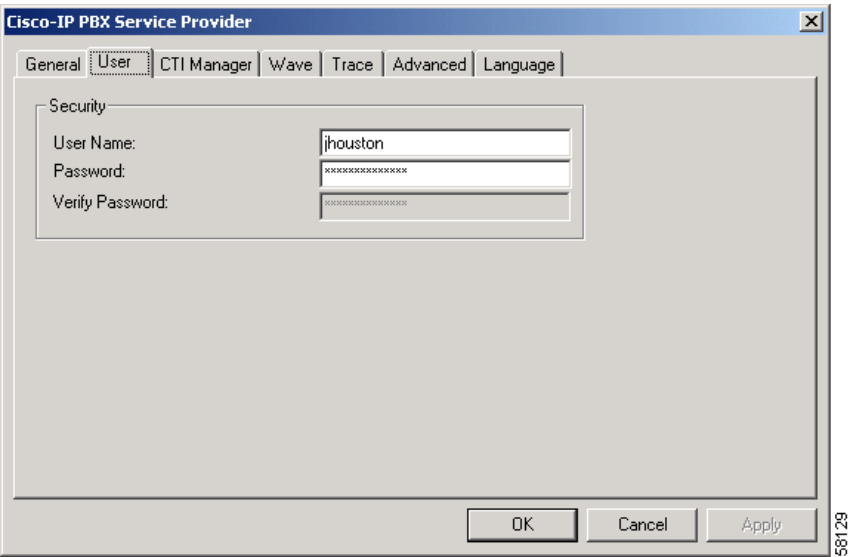
| Field                                         | Description                                                                                                                                                                                                                                        |
|-----------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Ask Before Update                             | This check box enables the user to control the auto update process. The Default is disabled.                                                                                                                                                       |
| Never AutoUpdate                              | The Default value is shown in <a href="#">Figure 1</a> . Choosing this radio button does not perform an auto update even after detecting an upgradeable plugin version on the Cisco Unified CallManager.                                           |
| Always AutoUpdate                             | Choose this radio button to allow the Cisco Unified CallManager TSP to auto update after detecting an upgradeable plugin version on the Cisco Unified CallManager.                                                                                 |
| AutoUpdate on Incompatible QBEProtocolVersion | Choose this radio button to allow the Cisco Unified CallManager TSP to auto update only when the local TSP version is incompatible with the Cisco Unified CallManager, and upgrading the TSP to the plugin version is the only choice to continue. |

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# User Tab

The User tab allows you to configure security information, as illustrated in [Figure 2](#).

**Figure 2** Cisco IP PBX Service Provider User Tab



[Table 2](#) contains a list of the fields for the User tab that must be set and their descriptions.

**LIMITED AVAILABILITY****Table 2      User Tab Configuration Fields**

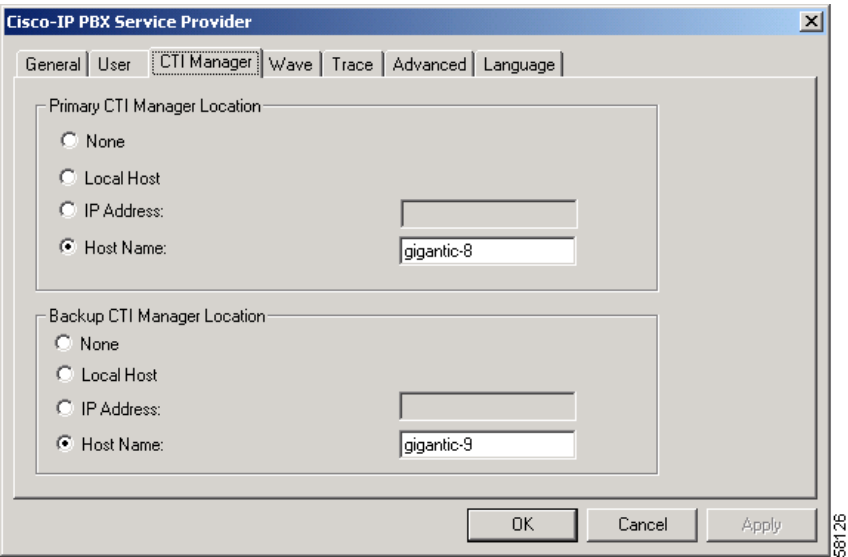
| Field           | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| User Name       | <p>Enter the user name of the user that you want to give access to devices. This TSP can access devices and lines that are associated with this user. Make sure that this user is also configured in the Cisco Unified CallManager, so TSP can connect to Cisco Unified CallManager.</p> <p>The TSP configuration registry keys store the user name and password that you enter.</p> <p><b>Note</b>    You can designate only one user name and password to be active at any time for a TSP.</p> |
| Password        | <p>Enter the password that is associated with the user that you entered in the User Name field. The computer encrypts the password and stores it in the registry.</p>                                                                                                                                                                                                                                                                                                                            |
| Verify Password | <p>Reenter the user password.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

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# CTI Manager Tab

The CTI Manager tab allows you to configure primary and secondary CTI Manager information, as illustrated in [Figure 3](#).

**Figure 3** Cisco-IP PBX Service Provider CTI Manager Tab



[Table 3](#) contains a list of the CTI Manager tab fields that must be set and their descriptions.

**LIMITED AVAILABILITY****Table 3 CTI Manager Configuration Fields**

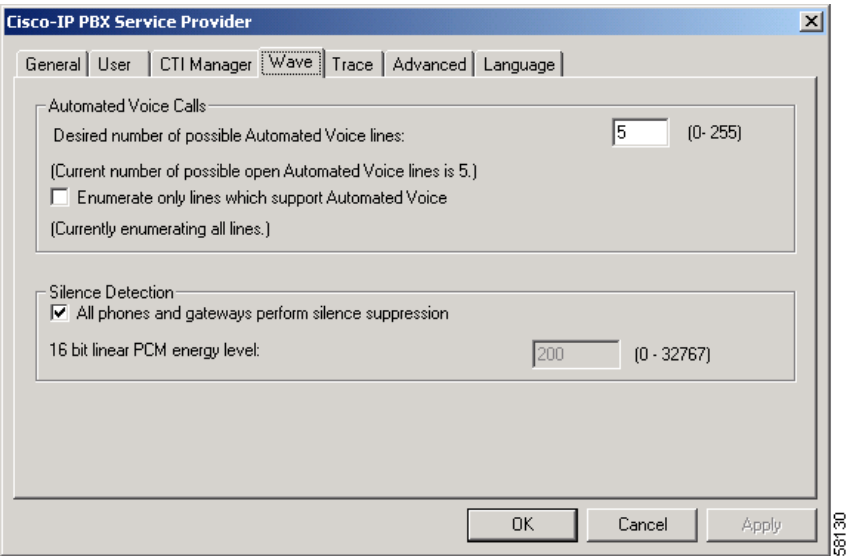
| Field                        | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Primary CTI Manager Location | <p>Use to specify the CTI Manager to which the TSP attempts to connect first.</p> <p>If the TSP is on the same computer as the primary CTIManager, choose the Local Host radio button.</p> <p>If the primary CTIManager is on a different computer, choose the IP Address radio button and enter the IP address of primary CTIManager or choose the Host Name radio button and enter the host name of primary CTI Manager.</p>                                        |
| Backup CTI Manager Location  | <p>Use to specify the CTI Manager to which the TSP attempts to connect if a connection to the primary CTI Manager fails.</p> <p>If the TSP is on the same computer as the backup CTIManager, choose the Local Host radio button.</p> <p>If the backup CTIManager is on a different computer, choose the IP Address radio button and enter the IP address of backup CTIManager or choose the Host Name radio button and enter the host name of backup CTI Manager.</p> |

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# Wave Tab

The Wave tab allows you to configure settings for your wave devices, as illustrated in [Figure 4](#).

**Figure 4** Cisco IP PBX Service Provider Wave Tab



[Table 4](#) contains a list of the Wave tab fields that must be set and their descriptions.

**LIMITED AVAILABILITY****Table 4 Wave Tab Configuration Fields**

| Field                 | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Automated Voice Calls | <p>The number of Cisco wave devices that you are using determines the possible number of automated voice lines. (The default is 5.) You can open as many CTI ports as the number of Cisco wave devices that are configured. For example, if you enter “5,” you need to create five CTI port devices in Cisco Unified CallManager. If you change this number, you need to remove and then reinstall any Cisco wave devices that you installed.</p> <p>You can only configure a maximum of 255 wave devices for all installed TSPs because Microsoft limits the number of wave devices per wave driver to 255.</p> <p>When you configure 256 or more wave devices (including Cisco or other wave devices), Windows displays the following error when you access the Sounds and Multimedia control panel: “An Error occurred while Windows was working with the Control Panel file C:\Winnt\System32\MMSYS.CPL.” TSP can still handle the installed Cisco wave devices as long as you have not configured more than 255 Cisco devices.</p> <p>The current number of possible automated voice lines designates the maximum number of lines that can be simultaneously opened by using both LINEMEDIAMODE_AUTOMATEDVOICE and LINEMEDIAMODE_INTERACTIVEVOICE.</p> <p>If you are not developing a third-party call control application, check the Enumerate only lines that support automated voice check box, so the Cisco Unified CallManager TSP detects only lines that are associated with a CTI port device.</p> |

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Table 4 Wave Tab Configuration Fields (continued)

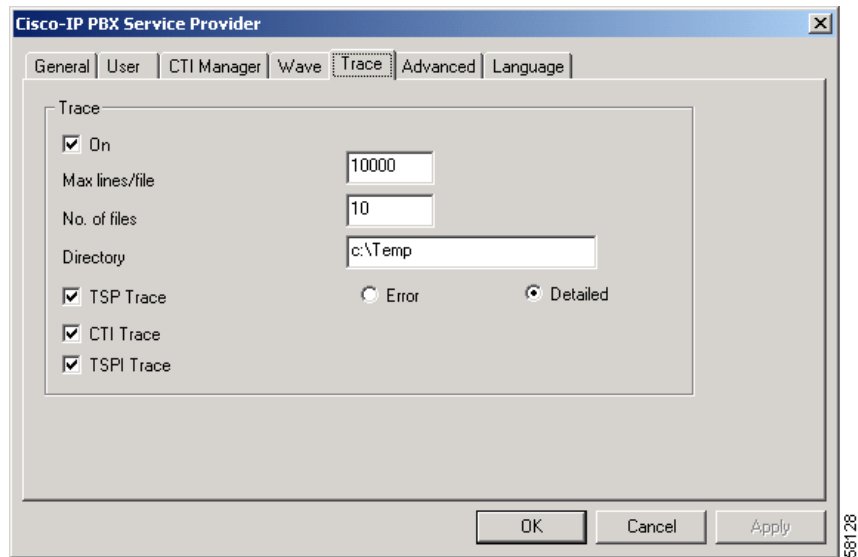
| Field             | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Silence Detection | <p>If you use silence detection, this check box notifies the wave driver which method to use to detect silence on lines that support automated voice calls that are using the Cisco Wave Driver. If the check box is checked (default), the wave driver searches for the absence of audio-stream RTP packets. Because all devices on the network suppress silence and stop sending packets, this method provides a very efficient way for the wave driver to detect silence.</p> <p>However, if some phones or gateways do not perform silence suppression, the wave driver must analyze the content of the media stream and, at some threshold, declare that silence is in effect. This CPU-intensive method handles media streams from any type of device.</p> <p>If some phones or gateways on your network do not perform silence suppression, you must specify the energy level at which the wave driver declares that silence is in effect. This value of the 16-bit linear PCM energy level ranges from 0 to 32767, and the default is 200. If all phones and gateways perform silence suppression, the system ignores this value.</p> |

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## Trace Tab

The Trace tab allows you to configure various trace settings, as illustrated in [Figure 5](#). Changes to trace parameters take effect immediately, even if TSP is running.

**Figure 5** Cisco IP PBX Service Provider Trace Tab



[Table 5](#) contains a list of the Trace tab fields that must be set and their descriptions.

**LIMITED AVAILABILITY****Table 5**      **Trace Tab Configuration Fields**

| Field          | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| On             | <p>This setting allows you to enable Global Cisco Unified CallManager TSP trace.</p> <p>Check the check box to enable Cisco Unified CallManager TSP trace. When you enable trace, you can modify other trace parameters in the dialog box. The Cisco Unified CallManager TSP trace depends on the other values that you enter in these fields.</p> <p>Uncheck the check box to disable Cisco Unified CallManager TSP trace. When you disable trace, you cannot choose any trace parameters in the dialog box, and TSP ignores the values that are entered in these fields.</p> |
| Max lines/file | Use to specify the maximum number of lines the trace file can contain. The default is 10,000. Once the file contains the maximum number of lines, trace opens the next file and writes to that file.                                                                                                                                                                                                                                                                                                                                                                           |
| No. of files   | Use to specify the maximum number of trace files. The default is 10. File numbering occurs in a rotating sequence starting at 0. The counter restarts at 0 after it reaches the maximum number of files minus one.                                                                                                                                                                                                                                                                                                                                                             |
| Directory      | <p>Use to specify the location in which trace files for all Cisco Unified CallManager TSPs are stored. Make sure that the specified directory exists.</p> <p>The system creates a subdirectory for each Cisco Unified CallManager TSP. For example, the CiscoTSP001Log directory stores Cisco Unified CallManager TSP 1 log files. The system creates trace files with filename TSP001Debug000xxx.txt for each TSP in its respective subdirectory.</p>                                                                                                                         |

**LIMITED AVAILABILITY****Table 5**      *Trace Tab Configuration Fields (continued)*

| <b>Field</b> | <b>Description</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|--------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| TSP Trace    | <p>This setting activates internal TSP tracing. When you activate TSP tracing, Cisco Unified CallManager TSP logs internal debug information that you can use for debugging purposes. You can choose one of the following levels:</p> <p>Error—Logs only TSP errors.</p> <p>Detailed—Logs all TSP details (such as, log function calls in the order that they are called).</p> <p>The system checks the TSP Trace check box and chooses the Error radio button by default.</p> |
| CTI Trace    | <p>This setting traces messages flowing between Cisco Unified CallManager TSP and CTI. Cisco Unified CallManager TSP communicates with the CTI Manager. By default, the system leaves the check box unchecked.</p>                                                                                                                                                                                                                                                             |
| TSPI Trace   | <p>This setting traces all messages and function calls between TAPI and Cisco Unified CallManager TSP. The system leaves this check box unchecked by default.</p> <p>If you check the check box, TSP traces all the function calls that TAPI makes to Cisco Unified CallManager TSP with parameters and messages (events) from Cisco Unified CallManager TSP to TAPI.</p>                                                                                                      |

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Advanced Tab

The Advanced tab allows you to configure timer settings, as illustrated in Figure 6.



Note

These timer settings that are meant for advanced users only rarely change.

Figure 6 Cisco IP PBX Service Provider Advanced Tab

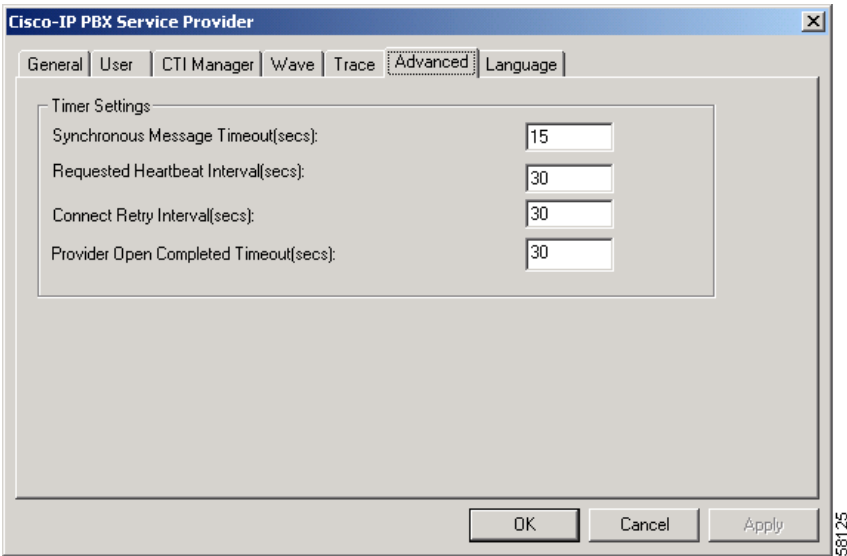


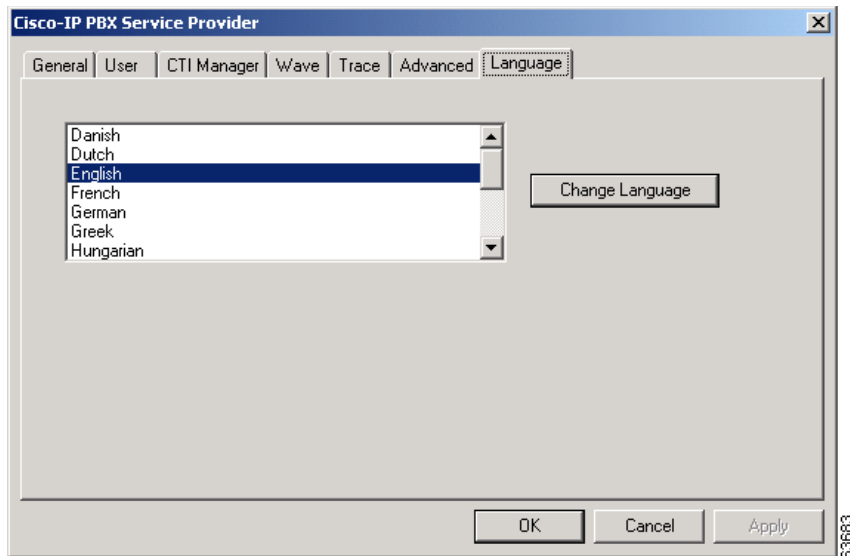
Table 6 contains a list of the Advanced tab fields that must be set and their descriptions.

**LIMITED AVAILABILITY****Table 6      Advanced Configuration Fields**

| Field                                  | Description                                                                                                                                                                                                                                                                                                                                                                |
|----------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Synchronous Message Timeout (secs)     | Use to designate the time that the TSP waits to receive a response to a synchronous message. The value displays in seconds, and the default is 15. Range goes from 5 to 60 seconds.                                                                                                                                                                                        |
| Requested Heartbeat Interval (secs)    | Use to designate the interval at which the heartbeat messages are sent from TSP to detect whether the CTI Manager connection is still alive. TSP sends heartbeats when no traffic exists between the TSP and CTI Manager for 30 seconds or more. The default interval is 30 seconds. Range goes from 30 to 300 seconds.                                                    |
| Connect Retry Interval (secs)          | Use to designate the interval between reconnection attempts after a CTI Manager connection failure. The default is 30 seconds. Range goes from 15 to 300 seconds.                                                                                                                                                                                                          |
| Provider Open Completed Timeout (secs) | Use to designate the time that the TSP waits for a Provider Open Completed Event. This event indicates that the initialization of CTI Manager is done and is ready to serve TSP requests. This initialization time is directly proportional to the number of devices that are configured in the system. The default value is 50 seconds. Range goes from 5 to 900 seconds. |

## Language Tab

The Language tab allows you to choose one of the installed languages to view the configuration settings in that language, as illustrated in [Figure 7](#).

**LIMITED AVAILABILITY****Figure 7 Cisco IP PBX Service Provider Language Tab**

Choose a language and click **Change Language** to reload the tabs with the text in that language.

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# Installing the Wave Driver

You can use the Cisco wave driver with Windows 2000 and Windows NT only. Windows 98 and Windows 95 do not support the Cisco wave driver.

You should install Cisco wave driver if you plan to use first-party call control. (Do this even if you are performing your own media termination.)

**Caution**

Because of a restriction in Windows NT, the software may overwrite or remove existing wave drivers from the system when you install or remove the Cisco wave driver on a Windows NT system. The procedures in this section for installing and uninstalling the Cisco wave driver on Windows NT include instructions on how to prevent existing wave drivers from being overwritten or removed.

To install the Cisco wave driver, perform the following steps.

**Procedure for Windows XP**

- 
- Step 1** Open the Control Panel.
  - Step 2** Open **Add/Remove Hardware**.
  - Step 3** Click **Next**.
  - Step 4** Select **Yes, I have already connected the hardware**.
  - Step 5** Select **Add a New Hardware Device**.
  - Step 6** Click **Next**.
  - Step 7** Select **Install the Hardware that I manually select from a list**.
  - Step 8** Click **Next**.
  - Step 9** For the hardware type, select **Sound, video and game controller**.
  - Step 10** Click **Next**.
  - Step 11** Click **Have Disk**.
  - Step 12** Click **Browse** and navigate to the Wave Drivers folder in the folder where the Cisco Unified CallManager TSP is installed.
  - Step 13** Choose **OEMSETUP.INF** and click **Open**.

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- Step 14** In the Install From Disk window, click **OK**.
- Step 15** Select the **Cisco TAPI Wave Driver** in the Select a Device Driver window and select **Next**.
- Step 16** Select **Next** in the Start Hardware Installation window.
- Step 17** If Prompted for Digital signature Not Found, click **Continue Anyway**.
- Step 18** The installation may issue the following prompt:
- The file avaudio32.dll on Windows NT Setup Disk #1 is needed,  
Type the path where the file is located and then click ok.
- If so, navigate to the same location as where you chose OEMSETUP.INF, select avaudio32.dll, and click **OK**.
- Step 19** Click **Yes**.
- Step 20** Click **Finish**.
- Step 21** Click **Yes** to restart to restart the computer .

### **Procedure for Windows 2000**

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- Step 1** Open the Control Panel.
- Step 2** Double-click **Add/Remove Hardware**.
- Step 3** Click **Next**.
- Step 4** Click **Add/Troubleshoot a Device** and click **Next**.
- Step 5** Click **Add a New Device** and click **Next**.
- Step 6** Click **No, I want to select the hardware from a list**.
- Step 7** Choose **Sound, video and game controllers** and click **Next**.
- Step 8** Click **Have Disk**.
- Step 9** Click **Browse** and change to the Wave Drivers folder in the folder where the Cisco Unified CallManager TSP is installed.
- Step 10** Choose **OEMSETUP.INF** and click **Open**.
- Step 11** In the Install From Disk window, click **OK**.
- Step 12** The Cisco TAPI Wave Driver displays on the screen. Click **Next**.
- Step 13** Click **Next**.

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- Step 14** The installation may issue the following prompt:  
Digital Signature Not Found
- Step 15** Click **Yes**.
- Step 16** The installation may issue the following prompt:  
The file avaudio32.dll on Windows NT Setup Disk #1 is needed,  
Type the path where the file is located and then click ok.  
If so, enter the same location as where you chose OEMSETUP.INF and click **OK**.
- Step 17** Click **Yes**.
- Step 18** Click **Finish**.
- Step 19** Click **Yes** to restart.
- 

### Procedure for Windows NT

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- Step 1** Before you add the Cisco wave driver, you must save the wave driver information from the registry in a separate file as described in the [“Saving Wave Driver Information”](#) section.
- Step 2** Open the Control Panel.
- Step 3** Double-click **Multimedia**.
- Step 4** Click **Next**.
- Step 5** Click **Add**.
- Step 6** Click **Unlisted** or **Updated Driver**.
- Step 7** Click **OK**.
- Step 8** Click **Browse** and change to the Wave Drivers folder in the folder where the Cisco Unified CallManager TSP is installed.
- Step 9** Click **OK**. Follow the online instruction, but *do not restart the system when prompted*.
- Step 10** Examine the contents of the registry to verify the new driver was installed and the old drivers still exist, as described in the [“Verifying the Wave Driver Exists”](#) section.
- Step 11** Restart the computer.

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# Saving Wave Driver Information

Use the following steps to save wave driver information from the registry in a separate file. You must perform this procedure when installing or uninstalling the Cisco wave driver on a Windows NT computer.

### Procedure

---

- Step 1** Click **Start > Run**.
  - Step 2** In the text box, enter **regedit**.
  - Step 3** Click **OK**.
  - Step 4** Choose the Drivers32 key that is located in the following path:  
HKEY\_LOCAL\_MACHINE\SOFTWARE\Microsoft\Windows NT\  
CurrentVersion
  - Step 5** Choose **Registry > Export Registry File**.
  - Step 6** Enter a filename and choose the location to save.
  - Step 7** Click **Save**.  
The file receives a .reg extension.
-

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# Verifying the Wave Driver Exists

When you install or uninstall the Cisco wave driver, you must verify whether it exists on your system. Use these steps to verify whether the wave driver exists.

### Procedure

---

- Step 1** Click **Start > Run**.
  - Step 2** In the text box, enter **regedit**.
  - Step 3** Click **OK**.
  - Step 4** Choose the Drivers32 key located in the following path:  
HKEY\_LOCAL\_MACHINE\SOFTWARE\Microsoft\Windows NT\CurrentVersion
  - Step 5** If you are installing the wave driver, make sure that the driver “avaudio32.dll” displays in the data column. If you are uninstalling the wave driver, make sure that the driver “avaudio32.dll does not display in the data column. This designates the Cisco wave driver.
  - Step 6** Verify that the previously existing wave values appear in the data column for wave1, wave2, wave3, and so on. You can compare this registry list to the contents of the .reg file that you saved in the “[Saving Wave Driver Information](#)” procedure by opening the .reg file in a text editor and viewing it and the registry window side by side.
  - Step 7** If necessary, add the appropriate waveX string values for any missing wave values that should be installed on the system. For each missing wave value, choose **Edit > New > String Value** and enter a value name. Then, choose **Edit > Modify**, enter the value data, and click **OK**.
  - Step 8** Close the registry by choosing **Registry > Exit**.
-

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# Verifying the Cisco Unified CallManager TSP Installation

You can use the Microsoft Windows Phone Dialer Application to verify that the Cisco Unified CallManager TSP is operational. For Windows NT and Windows 2000, locate the dialer application in

C:\Program Files\Windows NT\dialer.exe

For windows 95 and Windows 98, locate the dialer application in

C:\Windows\dialer.exe

### Procedure For Windows 2000 and Windows XP

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- Step 1** Open the Dialer application by locating it in Windows Explorer and double-clicking it.
  - Step 2** Choose **Edit > Options**.
  - Step 3** Choose **Phone** as the Preferred Line for Calling.
  - Step 4** In the Line Used For area, choose one Cisco Line in the Phone Calls drop-down menu.
  - Step 5** Click **OK**.
  - Step 6** Click **Dial**.
  - Step 7** Enter a number to dial, choose **Phone Call** in the Dial as box, and then click **Place Call**.
- 

### Procedure for Windows NT, Windows 98, and Windows 95

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- Step 1** Open the Dialer application by locating it in Windows Explorer and double-clicking it:  
  
A dialog box appears that requests the line and address that you want to use. If no lines are listed in the **Line** drop-down list box, a problem may exist between the Cisco Unified CallManager TSP and the Cisco Unified CallManager.

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- Step 2** Choose a line from the Line drop-down menu. Make sure Address is set to **Address 0**.
- Step 3** Click **OK**.
- Step 4** Enter a number to dial.
- 

If the call is successful, you have verified that the Cisco Unified CallManager TSP is operational on the machine where the Cisco Unified CallManager TSP is installed.

If you encounter problems during this procedure, or if no lines appear in the line drop-down list on the dialer application, check the following items:

- Make sure that the Cisco Unified CallManager TSP is configured properly.
- Test the network link between the Cisco Unified CallManager TSP and the Cisco Unified CallManager by using the ping command to check connectivity.
- Make sure that the Cisco Unified CallManager server is functioning.

## Setting Up Client-Server Configuration

For information on setting up a client-server configuration (Remote TSP) in Windows 2000, refer to the Microsoft Windows Help feature. For information on client-server configuration in Windows NT, refer to Microsoft White Papers.

## Uninstalling the Wave Driver

To remove the Cisco wave driver, perform the following steps.

### Procedure for Windows XP

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- Step 1** Open the Control Panel.
- Step 2** Select **Sound and Audio Devices**.
- Step 3** Click the **Hardware** tab.

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- Step 4** Select **Cisco TAPI Wave Driver**.
- Step 5** Click **Properties**.
- Step 6** Click the **Driver** tab.
- Step 7** Click **Uninstall** and **OK** to remove.
- Step 8** If the Cisco TAPI Wave Driver entry is still displayed, close and open the window again to verify that it has been removed.
- Step 9** Restart the computer.

### Procedure for Windows 2000

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- Step 1** Open the Control Panel.
  - Step 2** Double-click **Add/Remove Hardware**.
  - Step 3** Click **Next**.
  - Step 4** Choose **Uninstall/Unplug a device** and click **Next**.
  - Step 5** Choose **Uninstall a device** and click **Next**.
  - Step 6** Choose **Cisco TAPI Wave Driver** and click **Next**.
  - Step 7** Choose **Yes, I want to uninstall this device** and click **Next**.
  - Step 8** Click **Finish**.
  - Step 9** Restart the computer.
- 

### Procedure for Windows NT

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- Step 1** Before you uninstall the Cisco wave driver, you must save the wave driver information from the registry in a separate file. For information on how to save the wave drive information to a separate file, see the [“Saving Wave Driver Information”](#) section.
- Step 2** After the registry information is saved, open the Control Panel.
- Step 3** Double-click **Multimedia**.
- Step 4** Click the **Devices** tab.
- Step 5** To view all the audio devices, click the ‘+’ symbol next to Audio Devices.

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- Step 6** Click **Audio** for Cisco Sound System.
- Step 7** Click **Remove**.
- Step 8** Click **Finish**. *Do not restart the system.*
- Step 9** Verify that the Cisco wave driver was removed and the old drivers still exist. For information on how to do this, see the [“Verifying the Wave Driver Exists”](#) section.



**Note** When you verify the removal of the driver, make sure that Cisco wave driver “avaudio32.dll” does not appear in the data column.

- Step 10** Restart the computer.

## Removing the Cisco Unified CallManager TSP

This process removes the Cisco Unified CallManager TSP from the provider list but does not uninstall the TSP. To make these changes, perform the following steps.

### Procedure for Windows 2000

- Step 1** Open the Control Panel.
- Step 2** Double-click the **Phone and Modem** icon.
- Step 3** Click the **Advanced** tab.
- Step 4** Choose the Cisco Unified CallManager TSP that you want to remove.
- Step 5** To delete the Cisco Unified CallManager TSP from the list, click **Remove**.

### Procedure for Windows NT, Windows 98, and Windows 95

- Step 1** Open the Control Panel.
- Step 2** Double-click the **Telephony** icon.

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- Step 3** Click the **Advanced** tab.
- Step 4** Choose the Cisco Unified CallManager TSP that you want to remove.
- Step 5** To delete the Cisco Unified CallManager TSP from the list, click **Remove**.
- 

# Managing the Cisco Unified CallManager TSP

You can perform the following actions on all installed TSPs:

- Reinstall the existing Cisco Unified CallManager TSP version
- Upgrade to the newer version of the Cisco Unified CallManager TSP
- Uninstall the Cisco Unified CallManager TSP

You cannot change the number of installed Cisco Unified CallManager TSPs when you reinstall or upgrade the Cisco Unified CallManager TSPs.

### Related Topics

- [Reinstalling the Cisco Unified CallManager TSP](#)
- [Upgrading the Cisco Unified CallManager TSP](#)
- [Auto Update for Cisco Unified CallManager TSP Upgrades](#)
- [Uninstalling the Cisco Unified CallManager TSP](#)

# Reinstalling the Cisco Unified CallManager TSP

Use the following procedure to reinstall the Cisco Unified CallManager TSP on all supported platforms.

### Procedure

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- Step 1** Open the Control Panel and double-click **Add/Remove Programs**.
- Step 2** Choose Cisco Unified CallManager TSP and click **Add/Remove**.  
The Cisco Unified CallManager TSP maintenance install dialog box displays.
- Step 3** Click **Reinstall TSP 4.2(X.X)** radio button and click **Next**.

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**Step 4** Follow the online instructions.



**Note** If TSP files are already locked, the installation program prompts you to restart the computer.

## Upgrading the Cisco Unified CallManager TSP

Use the following procedure to upgrade the Cisco Unified CallManager TSP on all supported platforms.

### Procedure

**Step 1** Choose the type of installation for Cisco Unified CallManager TSP 4.2(X.X).

**Step 2** Choose **Upgrade from TSP X.X(X.X)** option radio button and click **Next**.

**Step 3** Follow the online instructions.



**Note** If TSP files are already locked, the installation program prompts you to restart the computer.

**Step 4** The Cisco Unified CallManager TSP maintenance install dialog box displays. If CiscoTSP.exe contains different version of Cisco Unified CallManager TSP than you have installed, the installation program displays one of the following prompts, depending upon the previous Cisco Unified CallManager TSP version:

Choose the type of installation for TSP Version 4.2(X.X).

If the previous installed version is Cisco CallManager TSP 3.1(X.X), the following prompt displays:

Upgrade from TSP 3.1(X.X)

If the previous installed version is Cisco CallManager TSP 3.2(X.X), the following prompt displays:

Upgrade from TSP 3.2(X.X)

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If the previous installed version is Cisco CallManager TSP 3.3(X.X), the following prompt displays:

Upgrade from 3.3(X.X)

If the previous installed version is Cisco Unified CallManager TSP 4.1(X.X), the following prompt displays:

Upgrade from TSP 4.1(X.X)

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## Auto Update for Cisco Unified CallManager TSP Upgrades

Cisco Unified CallManager TSP supports auto update functionality, so the latest plugin can be downloaded and installed on the client machine. When the Cisco Unified CallManager is upgraded to a higher version, and Cisco Unified CallManager TSP auto update functionality is enabled, the latest compatible Cisco Unified CallManager TSP is available, which is compatible with the upgraded CallManager. This ensures that the applications work as expected with the new release of Cisco Unified CallManager (provided the new call manager interface is backward compatible with the TAPI interface). The Cisco Unified CallManager TSP that is installed locally on the client server allows the application to set the auto update options as part of the Cisco Unified CallManager TSP configuration. You can opt for updating the Cisco Unified CallManager TSP in the following different ways.

- Update Cisco Unified CallManager TSP whenever a different (has to be higher version than existing) version is available on the Cisco Unified CallManager server.
- Update Cisco Unified CallManager TSP whenever a QBE protocol version mismatch occurs between the existing Cisco Unified CallManager TSP and the Cisco Unified CallManager version.
- Do not update Cisco Unified CallManager TSP by using the auto update functionality.

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### AutoInstall Behavior

As part of initialization of Cisco Unified CallManager TSP, when the application does lineInitializeEx, Cisco Unified CallManager TSP queries the current TSP plugin version information that is available on Cisco Unified CallManager server. Once this information is available, Cisco Unified CallManager TSP compares the installed Cisco Unified CallManager TSP version with the plugin version. If user chose an option for Auto Update, Cisco Unified CallManager TSP triggers the update process. As part of Auto Update, Cisco Unified CallManager TSP behaves in the following ways on different platforms.

#### Windows 95, Windows 98, Windows ME

Because Cisco Unified CallManager TSP is in use and locked when the application does lineInitializeEx, the auto update process requests that you close all the running applications to install the new TSP version on the client setup. When all the running applications get closed, Cisco Unified CallManager TSP auto update process can continue, and you will be informed about the upgrade success. If the running applications do not get closed and the installation continues, the new version of Cisco Unified CallManager TSP will not get installed, and a corresponding error gets reported to the applications.

#### Windows NT

After Cisco Unified CallManager TSP detects that an upgradeable version is available on the Cisco Unified CallManager server and Auto Update gets chosen, Cisco Unified CallManager TSP reports 0 lines to the application and removes the Cisco Unified CallManager TSP provider from the provider list. It will then try to stop the telephony service to avoid any locked files during Auto Update. If the telephony service can be stopped, Cisco Unified CallManager TSP gets silently auto updated and the service restarted. Applications must be reinitialized in order to start using the Cisco Unified CallManager TSP. If the telephony service could not be stopped, Cisco Unified CallManager TSP installs the new version and displays a message to restart the system. You must restart the system in order to use the new Cisco Unified CallManager TSP.

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### Windows 2000 or XP

After Cisco Unified CallManager TSP detects that an upgradeable version is available on the Cisco Unified CallManager server and Auto Update option gets chosen, Cisco Unified CallManager TSP reports 0 lines to the application and removes the Cisco Unified CallManager TSP provider from the provider list. If a new TSP version is detected during the reconnect time, the running applications receive LINE\_REMOVE on all the lines, which are already initialized and are in OutOfService state. Cisco Unified CallManager TSP silently upgrades to the new version that was downloaded from the Cisco Unified CallManager and puts the Cisco Unified CallManager TSP provider back on the provider list. All the running applications receive LINE\_CREATE messages.

WinXP supports multiple user logon sessions (fast user switching); however, this release supports Auto Update only for the first logon user. If multiple active logon sessions exist, Cisco Unified CallManager TSP only supports the Auto Update functionality for the first logged-on user.

**Note**

If a user has multiple Cisco Unified CallManager TSPs installed on the client machine, only the first Cisco Unified CallManager TSP instance is enabled to set up the Auto Update configuration. All Cisco Unified CallManager TSPs get upgraded to a common version upon version mismatch. From “Control Panel/Phone & Modem Options/Advanced/CiscoTSP001,” the General window displays the options for Auto Update.

Because it is a CTI service parameter, which can be configured, you can change the Plugin location to a different machine than the Cisco Unified CallManager server. The default is “//<CMServer>//ccmpluginserver”.

If Silent upgrade fails on any listed platforms for any reason (such as locked files that are encountered during upgrade on Win95/98/ME), the old Cisco Unified CallManager TSP provider(s) do not get put back on the provider list to avoid any looping of the Auto Update process. Ensure that the update options get cleared and the providers get added to provider list manually. Update the Cisco Unified CallManager TSP manually or by fixing the problem(s) encountered during Auto Update and reinitializing Cisco TAPI to trigger the Auto Update process.

**Note**

TSPAutoInstall.exe has user interface screens and can proceed to display these screens only when the telephony service enables the LocalSystem logon option with “Allow Service to interact with Desktop”. If the logon option is not set as

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LocalSystem or logon option is LocalSystem but “Allow Service to interact with Desktop” is disabled, Cisco Unified CallManager TSP cannot launch the AutoInstall UI windows and will not continue with AutoInstall.

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Ensure that the following logon options are set for the telephony service.

- 
- Step 1** Logon as: **LocalSystem**.
  - Step 2** Enable the check box: “Allow Service to interact with Desktop.”  
These telephony service settings, when changed, requires manual restart of the service to take effect.
  - Step 3** If, after changing the settings to above values, the service does not restart, Cisco Unified CallManager TSP checks for “Allow Service to interact with user” to be positive (as the configuration is updated for the service in the database), but AutoInstall UI cannot display. Cisco Unified CallManager TSP continues to put the entry for TSPAutoInstall.exe under Registry key RUNONCE. This will help autoinstall to run when the machine reboots the next time.
- 

## Uninstalling the Cisco Unified CallManager TSP

Use the following procedure to uninstall the Cisco Unified CallManager TSP on all supported platforms.

### Procedure

- 
- Step 1** Open the Control Panel and double-click **Add/Remove Programs**.
  - Step 2** Choose Cisco Unified CallManager TSP and click **Add/Remove**.  
The Cisco Unified CallManager TSP maintenance install dialog box displays.

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**Step 3** Choose **Uninstall: Remove the installed TSP** radio button and click **Next**.

**Step 4** Follow the online instructions.



**Note** If TSP files are already locked, the installation program prompts you to restart the computer.

## Obtaining Documentation

Cisco documentation and additional literature are available on Cisco.com. Cisco also provides several ways to obtain technical assistance and other technical resources. These sections explain how to obtain technical information from Cisco Systems.

### Cisco.com

You can access the most current Cisco documentation at this URL:

<http://www.cisco.com/univercd/home/home.htm>

You can access the Cisco website at this URL:

<http://www.cisco.com>

You can access international Cisco websites at this URL:

[http://www.cisco.com/public/countries\\_languages.shtml](http://www.cisco.com/public/countries_languages.shtml)

### Documentation DVD

Cisco documentation and additional literature are available in a Documentation DVD package, which may have shipped with your product. The Documentation DVD is updated regularly and may be more current than printed documentation. The Documentation DVD package is available as a single unit.

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Registered Cisco.com users (Cisco direct customers) can order a Cisco Documentation DVD (product number DOC-DOCDVD=) from the Ordering tool or Cisco Marketplace.

Cisco Ordering tool:

<http://www.cisco.com/en/US/partner/ordering/>

Cisco Marketplace:

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

## Ordering Documentation

You can find instructions for ordering documentation at this URL:

[http://www.cisco.com/univercd/cc/td/doc/es\\_inpk/pdi.htm](http://www.cisco.com/univercd/cc/td/doc/es_inpk/pdi.htm)

You can order Cisco documentation in these ways:

- Registered Cisco.com users (Cisco direct customers) can order Cisco product documentation from the Ordering tool:

<http://www.cisco.com/en/US/partner/ordering/>

- Nonregistered Cisco.com users can order documentation through a local account representative by calling Cisco Systems Corporate Headquarters (California, USA) at 408 526-7208 or, elsewhere in North America, by calling 1 800 553-NETS (6387).

## Documentation Feedback

You can send comments about technical documentation to [bug-doc@cisco.com](mailto:bug-doc@cisco.com).

You can submit comments by using the response card (if present) behind the front cover of your document or by writing to the following address:

Cisco Systems  
Attn: Customer Document Ordering  
170 West Tasman Drive  
San Jose, CA 95134-9883

We appreciate your comments.

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# Cisco Product Security Overview

Cisco provides a free online Security Vulnerability Policy portal at this URL:

[http://www.cisco.com/en/US/products/products\\_security\\_vulnerability\\_policy.html](http://www.cisco.com/en/US/products/products_security_vulnerability_policy.html)

From this site, you can perform these tasks:

- Report security vulnerabilities in Cisco products.
- Obtain assistance with security incidents that involve Cisco products.
- Register to receive security information from Cisco.

A current list of security advisories and notices for Cisco products is available at this URL:

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

If you prefer to see advisories and notices as they are updated in real time, you can access a Product Security Incident Response Team Really Simple Syndication (PSIRT RSS) feed from this URL:

[http://www.cisco.com/en/US/products/products\\_psirt\\_rss\\_feed.html](http://www.cisco.com/en/US/products/products_psirt_rss_feed.html)

## Reporting Security Problems in Cisco Products

Cisco is committed to delivering secure products. We test our products internally before we release them, and we strive to correct all vulnerabilities quickly. If you think that you might have identified a vulnerability in a Cisco product, contact PSIRT:

- Emergencies—[security-alert@cisco.com](mailto:security-alert@cisco.com)
- Nonemergencies—[psirt@cisco.com](mailto:psirt@cisco.com)

**Tip**

We encourage you to use Pretty Good Privacy (PGP) or a compatible product to encrypt any sensitive information that you send to Cisco. PSIRT can work from encrypted information that is compatible with PGP versions 2.x through 8.x.

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Never use a revoked or an expired encryption key. The correct public key to use in your correspondence with PSIRT is the one that has the most recent creation date in this public key server list:

<http://pgp.mit.edu:11371/pks/lookup?search=psirt%40cisco.com&op=index&export=on>

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In an emergency, you can also reach PSIRT by telephone:

- 1 877 228-7302
- 1 408 525-6532

## Obtaining Technical Assistance

For all customers, partners, resellers, and distributors who hold valid Cisco service contracts, Cisco Technical Support provides 24-hour-a-day, award-winning technical assistance. The Cisco Technical Support Website on Cisco.com features extensive online support resources. In addition, Cisco Technical Assistance Center (TAC) engineers provide telephone support. If you do not hold a valid Cisco service contract, contact your reseller.

## Cisco Technical Support Website

The Cisco Technical Support Website provides online documents and tools for troubleshooting and resolving technical issues with Cisco products and technologies. The website is available 24 hours a day, 365 days a year, at this URL:

<http://www.cisco.com/techsupport>

Access to all tools on the Cisco Technical Support Website requires a Cisco.com user ID and password. If you have a valid service contract but do not have a user ID or password, you can register at this URL:

<http://tools.cisco.com/RPF/register/register.do>

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**Note**

Use the Cisco Product Identification (CPI) tool to locate your product serial number before submitting a web or phone request for service. You can access the CPI tool from the Cisco Technical Support Website by clicking the **Tools & Resources** link under Documentation & Tools. Choose **Cisco Product Identification Tool** from the Alphabetical Index drop-down list, or click the **Cisco Product Identification Tool** link under Alerts & RMAs. The CPI tool offers three search options: by product ID or model name; by tree view; or for certain products, by copying and pasting **show** command output. Search results show an illustration of your product with the serial number label location highlighted. Locate the serial number label on your product and record the information before placing a service call.

## Submitting a Service Request

Using the online TAC Service Request Tool is the fastest way to open S3 and S4 service requests. (S3 and S4 service requests are those in which your network is minimally impaired or for which you require product information.) After you describe your situation, the TAC Service Request Tool provides recommended solutions. If your issue is not resolved using the recommended resources, your service request is assigned to a Cisco TAC engineer. The TAC Service Request Tool is located at this URL:

<http://www.cisco.com/techsupport/servicerequest>

For S1 or S2 service requests or if you do not have Internet access, contact the Cisco TAC by telephone. (S1 or S2 service requests are those in which your production network is down or severely degraded.) Cisco TAC engineers are assigned immediately to S1 and S2 service requests to help keep your business operations running smoothly.

To open a service request by telephone, use one of the following numbers:

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

EMEA: +32 2 704 55 55

USA: 1 800 553-2447

For a complete list of Cisco TAC contacts, go to this URL:

<http://www.cisco.com/techsupport/contacts>

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### Definitions of Service Request Severity

To ensure that all service requests are reported in a standard format, Cisco has established severity definitions.

**Severity 1 (S1)**—Your network is “down,” or there is a critical impact to your business operations. You and Cisco will commit all necessary resources around the clock to resolve the situation.

**Severity 2 (S2)**—Operation of an existing network is severely degraded, or significant aspects of your business operation are negatively affected by inadequate performance of Cisco products. You and Cisco will commit full-time resources during normal business hours to resolve the situation.

**Severity 3 (S3)**—Operational performance of your network is impaired, but most business operations remain functional. You and Cisco will commit resources during normal business hours to restore service to satisfactory levels.

**Severity 4 (S4)**—You require information or assistance with Cisco product capabilities, installation, or configuration. There is little or no effect on your business operations.

### Obtaining Additional Publications and Information

Information about Cisco products, technologies, and network solutions is available from various online and printed sources.

- Cisco Marketplace provides a variety of Cisco books, reference guides, and logo merchandise. Visit Cisco Marketplace, the company store, at this URL:  
<http://www.cisco.com/go/marketplace/>
- *Cisco Press* publishes a wide range of general networking, training and certification titles. Both new and experienced users will benefit from these publications. For current Cisco Press titles and other information, go to Cisco Press at this URL:  
<http://www.ciscopress.com>
- *Packet* magazine is the Cisco Systems technical user magazine for maximizing Internet and networking investments. Each quarter, Packet delivers coverage of the latest industry trends, technology breakthroughs, and Cisco products and solutions, as well as network deployment and

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

<http://www.cisco.com/packet>

- *iQ Magazine* is the quarterly publication from Cisco Systems designed to help growing companies learn how they can use technology to increase revenue, streamline their business, and expand services. The publication identifies the challenges facing these companies and the technologies to help solve them, using real-world case studies and business strategies to help readers make sound technology investment decisions. You can access iQ Magazine at this URL:

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

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

<http://www.cisco.com/ipj>

- World-class networking training is available from Cisco. You can view current offerings at this URL:

<http://www.cisco.com/en/US/learning/index.html>

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