



Computer Telephony Integration

Computer telephony integration (CTI) enables you to leverage computer-processing functions while making, receiving, and managing telephone calls. CTI applications allow you to perform such tasks as retrieving customer information from a database on the basis of information that caller ID provides. CTI applications can also enable you to use information that an interactive voice response (IVR) system captures, so the call can be routed to the appropriate customer service representative or so the information is provided to the individual who is receiving the call.

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Computer Telephony Integration Applications

The following list contains descriptions of some Cisco CTI applications that are available:

- **Cisco IP Communicator**—Cisco IP Communicator, a desktop application, turns your computer into a full-feature telephone with the added advantages of call tracking, desktop collaboration, and one-click dialing from online directories. You can also use Cisco IP Communicator in tandem with a Cisco Unified IP Phone to place, receive, and control calls from your desktop PC. All features function in both modes of operation.
- **Cisco Unified CallManager AutoAttendant**—The Cisco IP AutoAttendant application works with Cisco Unified CallManager to receive calls on specific telephone extensions and to allow the caller to choose an appropriate extension.
- **Cisco Unified CallManager Attendant Console**—This application provides a graphical user interface for controlling a Cisco Unified IP Phone to perform attendant console functions.

- Cisco WebDialer—Cisco WebDialer, which is installed on a Cisco Unified CallManager server and is used in conjunction with Cisco Unified CallManager, allows Cisco Unified IP Phone users to make calls from web and desktop applications.

**Note**

To determine which Cisco Unified CallManager CTI applications support Cisco SIP IP phones, refer to the application-specific documentation.

CTIManager

A program called CTIManager includes the CTI components that interface with the applications that are separated out of Cisco Unified CallManager. The CTIManager service communicates with Cisco Unified CallManager by using the Cisco Unified CallManager communication framework, System Distribution Layer (SDL). Installation of the CTIManager program occurs on the Cisco Unified CallManager server during the Cisco Unified CallManager installation. You can have one or more CTIManagers active in a cluster, but only one CTIManager can exist on an individual server. An application (JTAPI/TAPI) can have simultaneous connections to multiple CTIManagers; however, an application can use only one connection at a time to open a device with media termination.

With CTIManager, applications can access resources and functionality of all Cisco Unified CallManagers in the cluster and have access to failover capability. When a CTIManager fails, the application can access the secondary CTIManager only if the application supports it (for JTAPI applications) or if the Cisco TAPI Service Provider (Cisco TSP) is properly configured (for TAPI applications). For more information about failover and fallback, see the [“CTI Redundancy” section on page 45-6](#).

CTIManager provides two advanced, clusterwide service parameters that are used in conjunction with the CTI Super Provider capability:

- Maximum Devices Per Provider—This parameter specifies the maximum number of devices that a single CTI application can open. The default specifies 2000 devices.
- Maximum Devices Per Node—This parameter specifies the maximum number of devices that all CTI applications can open on any CTIManager node in the Cisco Unified CallManager system. The default specifies 800 devices.

If the configured limits are exceeded, CTI generates alarms, but the applications continue to operate with the extra devices. For more information on CTI Super Provider, see the [“User Management and CTI Controlled Devices” section on page 45-5](#).

Media Termination Points

CTI applications can terminate media on CTI ports and CTI route points in the following ways:

- Static IP address and port number—Specify the media IP address and port number when the device gets opened. In this case, the media always terminates at the same IP address and port for all calls that are on that device. Only one application can terminate the media in this way.
- Dynamic IP address or port number—Specify the media IP address or port number on a per-call basis. For each call that requires a media termination, notification gets sent to the application that requests the media termination information. The application then must send the IP address or port number back, so the media can go through. You can specify only the IP address or port number on

a per-call basis. The capabilities of the device still get specified statically when the device is opened. With dynamic media termination, multiple applications can open a device (CTI port or route point) for media termination as long as the capabilities that each application specifies stay the same.

CTI-Controlled Devices

The following CTI-controlled device types exist:

- Cisco Unified IP Phones (SCCP and SIP)

**Note**

CTI applications support only some Cisco SIP IP phones; for example, the Cisco SIP IP Phone 7940 and 7960 are not supported.

- CTI ports
- CTI route points

Cisco Unified IP Phones

CTI-controlled Cisco Unified IP Phones comprise SCCP phones that a CTI application can control. CTI supports Cisco SIP IP Phones (models 7911, 7941, 7961, 7970, and 7971) from the CTI interfaces JTAPI and TAPI, with some limited functionality. CTI applications control and monitor SIP phones in the same manner as CTI controlled/monitored SCCP phones.

For SCCP phones, outbound dialing supports enbloc (the phone collects all digits before passing them to Cisco Unified CallManager for routing) or digit-by-digit collection. If dialing is done digit-by-digit, a CTI dialing call state notification gets sent to the phone when it goes off hook and the first digit is pressed for an outgoing call. For enbloc outbound dialing, the dialing call state notification gets delayed until the phone collects all the digits and sends them to Cisco Unified CallManager for routing.

For SIP phones, enbloc dialing always gets used even if the user first goes off hook before dialing digits; the phone will wait until all the digits are collected before sending the digits to Cisco Unified CallManager. This means that the dialing call state notification will only get generated after enough digits are pressed on the phone to match one of the configured dialing patterns. In all cases, the dialing state notifications will always get generated prior to the call being routed to the destination (as is the case with SCCP phones).

SIP phones control when and how long to play reorder tone. When a SIP phone receives a request to play reorder tone, it releases the resources from Cisco Unified CallManager and plays reorder tone.

Therefore, the call appears to be idle to a CTI application regardless of when reorder tone is played on the phone. In these scenarios, applications can receive and initiate calls from the phone whether there is reorder tone being played by the phone. Because resources have been released on Cisco Unified CallManager, the call does not count against the busy trigger and maximum number of call counters (that are configured on the Directory Number Configuration window).

**Note**

Cisco SIP IP phones that are configured to use UDP as the transport mode (instead of TCP) will not support the device data pass-through functionality; for example, the Quality Reporting Tool (QRT) requires the data pass-through functionality, so it cannot be used with IP phones configured with UDP.

CTI Ports

CTI ports as virtual devices can have one or more virtual lines, and software-based Cisco Unified CallManager applications such as Cisco SoftPhone, Cisco Unified CallManager AutoAttendant, and Cisco Unified IP Interactive Voice Response (IVR) use them. You configure CTI ports by using the same Cisco Unified CallManager Administration windows as you use to configure phones. For first-party call control, you must add a CTI port for each active voice line.

CTI Route Point

A CTI route point virtual device can receive multiple, simultaneous calls for application-controlled redirection. You can configure one or more lines on a CTI route point that users can call to access the application. Applications can answer calls at a route point and can also redirect calls to a CTI port or IP phone. Route points can receive multiple, simultaneous calls; therefore, applications wanting to terminate media for calls at route points must specify the media and port for the call on a per-call basis.

CTI route points support the following features:

- Answer a call
- Make and receive multiple active calls
- Redirect a call
- Hold a call
- Unhold a call
- Drop a call

When a call arrives at a route point, the application must handle (accept, answer, redirect) it within a specified time. To configure the time that is allowed to answer a call, use the Cisco Unified CallManager CTI New Call Accept Timer service parameter. Use the Directory Number Configuration window in Cisco Unified CallManager Administration to configure the number of simultaneous active calls on the route point.



Note

If you are planning to use a TAPI application to control CTI port devices by using the Cisco Unified CallManager Telephony Service Provider (TSP), you may only configure one line per CTI port device.

Applications that are identified as users can control CTI devices. When users have control of a device, they can control certain settings for that device, such as answer the call and call forwarding.

CTI devices (CTI ports, CTI route points) must associate with device pools that contain the list of eligible Cisco Unified CallManagers for those devices. For general instructions on how to configure settings for CTI ports, refer to the [“Configuring Cisco Unified IP Phones”](#) section in the *Cisco Unified CallManager Administration Guide*. For general instructions on how to configure settings for CTI route points, refer to the [“Configuring a CTI Route Point”](#) section in the *Cisco Unified CallManager Administration Guide*. For information on how to configure CTI ports and route points for use with a specific application, such as Cisco IP Communicator, refer to the documentation and online help that is provided with that application.

When a CTI device fails (during a Cisco Unified CallManager failure, for example), Cisco Unified CallManager maintains media streams that are already connected between devices (for devices that support this feature). Cisco Unified CallManager drops calls that are in the process of being set up or modified (transfer, conference, redirect, and so on).

User Management and CTI Controlled Devices

To allow a CTI application to control or monitor devices, the devices must be assigned to the end user or application user that is associated with the CTI application. This gets done by using the End User or Application User Configuration windows in Cisco Unified CallManager Administration. From the Device Association pane of the User Configuration window, an administrator associates the desired devices to the Controlled Devices list.

To allow CTI applications access to certain CTI capabilities, the end user or application user that is associated with the application must be added to one or more of the following CTI-related user groups:

- Standard CTI Allow Call Park Monitoring—This user group allows an application to receive notification when calls are parked/unparked to all Call Park directory numbers.
- Standard CTI Allow Calling Number Modification—This user group allows an application to modify the calling party number in supported CTI applications.
- Standard CTI Allow Control of All Devices—This user group allows an application to control or monitor any CTI-controllable device in the system.
- Standard CTI Allow Reception of SRTP Key Material—This user group allows an application to receive information that is necessary to decrypt encrypted media streams. This group typically gets used for recording and monitoring purposes.
- Standard CTI Enabled—This user group, which is required for all CTI applications, allows an application to connect to Cisco Unified CallManager to access CTI functionality.
- Standard CTI Secure Connection—Inclusion into this group will require that the application have a secure (TLS) CTI connection to Cisco Unified CallManager if the Cisco Unified CallManager cluster security is enabled.

**Note**

The CTI application must support the specified user group to which it gets assigned. Refer to the appropriate application documentation for more information.

For more information on End User and User Group Configuration, see [Adding an End User](#) and [Adding Users to a User Group](#) in the *Cisco Unified CallManager Administration Guide*.

**Note**

Cisco recommends that users associated with the Standard CTI Allow Control of All Devices user group also be associated with the Standard CTI Secure Connection user group.

Applications That Monitor and Control All CTI-Controllable Devices

By adding an application user to the user group, Standard CTI Allow Control of All Devices, a CTI application can control any CTI-controllable devices that are configured in the Cisco Unified CallManager system. These applications sometimes get referred to as super provider applications. CTI super provider application dynamically associates/disassociates devices to/from an application control list, so this list/set of devices could be a variable list/set. For example, if 10,000 CTI-controllable devices exist in a Cisco Unified CallManager cluster, and CTI scalability limit is 2500 per provider, the application can open 2500 devices out of 10,000 devices (the number of devices gets configured by using service parameters; see the [“CTIManager” section on page 45-2](#)). For CTI super

provider applications, these 2500 devices do not remain fixed because applications can close these devices and open another set of 2500 devices, which makes this a variable set of devices (within CTI scalability limits).

The system administrator configures the CTI super provider capability by adding the application user or end user to the Standard CTI Allow Control of All Devices user group. The administrator uses the User Groups Configuration window in Cisco Unified CallManager Administration to add users to user groups.

For information about CTI-controllable devices, see the [“CTI-Controlled Devices” section on page 45-3](#).

All CTI applications with super provider capability exercise control over any CTI-controllable devices in the system. If an application needs to know only the status of a device, it opens the device and gets the status. Because CTI super provider controls any device, you cannot exclude any device from CTI super provider control. CTI system limits determine the maximum number of devices that a CTI application can control. See the [“CTIManager” section on page 45-2](#) for a description of CTI maximum limits. If the limits are exceeded, CTI generates alarms.

If a CTI application monitors a call park number, you must add the application to the Standard CTI Allow Call Park Monitoring user group (see [Finding a User Group](#) in the *Cisco Unified CallManager Administration Guide*).

Dependency Records

To find the directory numbers that a specific CTI route point is using, click the Dependency Records link that is provided on the Cisco Unified CallManager Administration CTI Route Point Configuration window. The Dependency Records Summary window displays information about directory numbers that are using the route point. To find out more information about the directory number, click the directory number, and the Dependency Records Details window displays. If the dependency records are not enabled for the system, the dependency records summary window displays a message.

For more information about Dependency Records, refer to [Accessing Dependency Records](#) and [Deleting a CTI Route Point](#) in the *Cisco Unified CallManager Administration Guide*.

CTI Redundancy

CTI provides recovery of failure conditions that result from a failed Cisco Unified CallManager node within a cluster and failure of a CTIManager. This section describes the failover and fallback capabilities of the following components:

- Cisco Unified CallManager
- CTIManager
- Applications (TAPI/JTAPI)

Cisco Unified CallManager

When a Cisco Unified CallManager node in a cluster fails, the CTIManager recovers the affected CTI ports and route points by reopening these devices on another Cisco Unified CallManager node. If an application has a phone device open, the CTIManager also reopens the phone when the phone fails over to a different Cisco Unified CallManager. If the Cisco Unified IP Phone does not fail over to a different Cisco Unified CallManager, the CTIManager cannot open the phone or a line on the phone. The

CTIManager uses the Cisco Unified CallManager group that is assigned to the device pool to determine which Cisco Unified CallManager to use to recover the CTI devices and phones that the applications opened.

When the CTIManager initially detects the Cisco Unified CallManager failure, it notifies the application (JTAPI/TAPI) that the devices on that Cisco Unified CallManager went out of service. If no other Cisco Unified CallManager in the group is available, the devices remain out of service. When those devices successfully rehome to another Cisco Unified CallManager, the CTIManager notifies the application that the devices are back in service.

When a failed Cisco Unified CallManager node comes back in service, the CTIManager rehomes the affected CTI ports/route points to their original Cisco Unified CallManager. The rehoming process starts when calls are no longer being processed or active on the affected device. Because devices cannot be rehomed while calls are being processed or active, the rehoming process may not occur for a long time, especially for route points that can handle many simultaneous calls.

If none of the Cisco Unified CallManagers in the Cisco Unified CallManager group is available, the CTIManager waits until a Cisco Unified CallManager comes into service and tries to open the CTI device again. If for some reason the Cisco Unified CallManager cannot open the device or associated lines when it comes back into service, the CTIManager closes the device and lines.

CTIManager

When a CTIManager fails, the applications that are connected to the CTIManager can recover the affected resources by reopening these devices on another CTIManager. An application determines which CTIManager to use on the basis of CTIManagers that you defined as primary and backup when you set up the application (if supported by the application). When the application connects to the new CTIManager, it can reopen the devices and lines that previously opened. An application can reopen a Cisco Unified IP Phone before the phone rehomes to the new Cisco Unified CallManager; however, it cannot control the phone until the rehoming completes.



Note

The applications do not rehome to the primary CTIManager when it comes back in service. Applications fail back to the primary CTIManager if you restart the application or if the backup CTIManager fails.

Application Failure

In the Application Heartbeat Maximum Interval and Application Heartbeat Minimum Interval parameters, you define the interval at which applications send messages to the CTIManager. The CTIManager determines that an application has failed if it does not receive a message from the application in two consecutive intervals. When an application (TAPI/JTAPI or an application that directly connects to the CTIManager) fails, the CTIManager closes the application and redirects untermiated calls at CTI ports and route points to the application that configured the call forward on failure (CFOF) number. The CTIManager also routes new calls into CTI ports and route points that an application does not open to the application CFNA number.

CTI Configuration Checklist

Table 45-1 provides steps to configure Cisco Unified CallManager for CTI applications.


Note

To make the CTI application secure, consult the information on configuring authentication and encryption for CTI in the *Cisco Unified CallManager Security Guide*.

Table 45-1 **CTI Configuration Checklist**

Configuration Steps		Procedures and Related Topics
Step 1	Configure the appropriate CTIManager and Cisco CallManager service parameters.	Service Parameters Configuration , <i>Cisco Unified CallManager Administration Guide</i>
Step 2	Add and configure an IP phone, CTI route points, or ports for each CTI application.	Configuring a CTI Route Point , <i>Cisco Unified CallManager Administration Guide</i> Configuring Cisco Unified IP Phones , <i>Cisco Unified CallManager Administration Guide</i>
Step 3	Configure the directory number for the CTI device.	Configuring a Directory Number , <i>Cisco Unified CallManager Administration Guide</i>
Step 4	Associate all devices that the application will use with the appropriate Cisco Unified CallManager group (via the device pool).	Configuring a Device Pool , <i>Cisco Unified CallManager Administration Guide</i>
Step 5	Configure the end users and application users that will use CTI applications. Add the device that is used for CTI applications (for example, IP phone, CTI port) to the Controlled Devices list that is on the End User and Application Users Configuration window.	Adding an End User , <i>Cisco Unified CallManager Administration Guide</i> Adding an Application User , <i>Cisco Unified CallManager Administration Guide</i>
Step 6	Add the end users and application users to the Standard CTI Enabled user group. Note All CTI users must be in the Standard CTI Enabled user group, but they may also be in other CTI user groups.	Adding Users to a User Group , <i>Cisco Unified CallManager Administration Guide</i>
Step 7	Activate the CTIManager service on the appropriate servers, if not already activated.	<i>Cisco Unified CallManager Serviceability Administration Guide</i>
Step 8	Install and configure your applications.	Refer to the documentation that is provided with your application.
Step 9	Restart application engine (if required).	Refer to the documentation that is provided with your application.

Where to Find More Information

Related Topic

- [Redundancy, page 7-1](#)

Additional Cisco Documentation

- *Cisco Unified CallManager JTAPI Developer Guide*
- *Cisco TAPI Developer Guide*
- *Cisco Unified CallManager Serviceability Administration Guide*
- *Cisco Unified CallManager Serviceability System Guide*
- *Cisco Unified CallManager Security Guide*

