



CHAPTER 22

External Call Control

Cisco Unified Communications Manager 8.0(2) (or higher) supports the external call control feature, which enables an adjunct route server to make call-routing decisions for Cisco Unified Communications Manager by using the 8.0(2) Cisco Unified Routing Rules Interface. When you configure external call control, Cisco Unified Communications Manager issues a route request that contains the calling party and called party information to the adjunct route server. The adjunct route server receives the request, applies appropriate business logic, and returns a route response that instructs Cisco Unified Communications Manager on how the call should get routed, along with any additional call treatment that should get applied.

The adjunct route server can instruct Cisco Unified Communications Manager to allow, divert, or deny the call, modify calling and called party information, play announcements to callers, reset call history so adjunct voicemail and IVR servers can properly interpret calling/called party information, and log reason codes that indicate why calls were diverted or denied. The following examples show how external call control can work:

- **Best Quality Voice Routing**—The adjunct route server monitors network link availability, bandwidth usage, latency, jitter, and MOS scores to ensure calls are routed through voice gateways that deliver the best voice quality to all call participants.
- **Least Cost Routing**—The adjunct route server is configured with carrier contract information such as Lata and Inter-Lata rate plans, trunking costs, and burst utilization costs to ensure calls are routed over the most cost effective links.
- **Ethical Wall**—The adjunct route server is configured with corporate policies that determine reachability; for example, Is user 1 allowed to call user 2?. When Cisco Unified Communications Manager issues a route request, the route server sends a response that indicates whether the call should be allowed, denied, or redirected to another party.

For more information on the Cisco Unified Routing Rules interface, see the *Cisco Unified Communications Manager XML Developers Guide for Release 8.0(2)* at http://www.cisco.com/en/US/products/sw/voicesw/ps556/products_programming_reference_guides_list.html.

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Configuration Checklist for External Call Control

Cisco Unified Communications Manager, Release 8.0(2) (or higher), supports the external call control feature, which enables an adjunct route server to make call-routing decisions for Cisco Unified Communications Manager by using the 8.0(2) Cisco Unified Routing Rules Interface. When you configure external call control, Cisco Unified Communications Manager issues a route request that contains the calling party and called party information to the adjunct route server. The adjunct route server receives the request, applies appropriate business logic, and returns a route response that instructs Cisco Unified Communications Manager on how the call should get routed, along with any additional call treatment that should get applied.

The adjunct route server can instruct Cisco Unified Communications Manager to allow, divert, or deny the call, modify calling and called party information, play announcements to callers, reset call history so adjunct voicemail and IVR servers can properly interpret calling/called party information, and log reason codes that indicate why calls were diverted or denied. The following examples show how external call control can work:

- **Best Quality Voice Routing**—The adjunct route server monitors network link availability, bandwidth usage, latency, jitter, and MOS scores to ensure calls are routed through voice gateways that deliver the best voice quality to all call participants.
- **Least Cost Routing**—The adjunct route server is configured with carrier contract information such as Lata and Inter-Lata rate plans, trunking costs, and burst utilization costs to ensure calls are routed over the most cost effective links.
- **Ethical Wall**—The adjunct route server is configured with corporate policies that determine reachability; for example, Is user 1 allowed to call user 2?. When Cisco Unified Communications Manager issues a route request, the route server sends a response that indicates whether the call should be allowed, denied, or redirected to another party.

Table 22-1 provides a checklist for configuring external call control in your network. For more information on how external call control works, see the “[Introducing External Call Control for Cisco Unified Communications Manager](#)” section on page 22-5 and the “[Interactions and Restrictions](#)” section on page 22-10.

Table 22-1 External Call Control Configuration Checklist

Configuration Steps		Related Procedures and Topics
Step 1	Set up the Cisco Unified Routing Rules Interface so that the route server can direct Cisco Unified Communications Manager on how to handle calls.	<i>Cisco Unified Communications Manager XML Developers Guide</i>
Step 2	Configure a calling search space that Cisco Unified Communications Manager uses when the route server sends a divert obligation to Cisco Unified Communications Manager. (Call Routing > Class of Control > Calling Search Space) You assign this calling search space to the external call control profile when you configure the profile.	Calling Search Space Configuration , <i>Cisco Unified Communications Manager Administration Guide</i>
Step 3	Configure the external call control profile(s). (Call Routing > External Call Control Profile)	External Call Control Profile Configuration Settings , page 22-15 Finding Configuration Records for External Call Control Profiles , page 22-19 Configuring an External Call Control Profile , page 22-20
Step 4	For the translation patterns that you want to use with external call control, assign an external call control profile to the pattern. (Call Routing > Translation Pattern)	Assigning the External Call Control Profile to the Translation Pattern , page 22-21
Step 5	If the route server uses https, import the certificate for the route server into the trusted store on the Cisco Unified Communications Manager server. (In Cisco Unified Communications Operating System, choose Security > Certificate Management .) You must perform this task on each node in the cluster that can send routing queries to the route server.	External Call Control Profile Configuration Settings , page 22-15
Step 6	If the route server uses https, export the Cisco Unified Communications Manager self-signed certificate to the route server. (In Cisco Unified Communications Operating System, choose Security > Certificate Management .) You must perform this task for each node in the cluster that can send routing queries to the route server.	Generating a Cisco Unified Communications Manager Self-Signed Certificate For Export , page 22-22

Table 22-1 External Call Control Configuration Checklist (continued)

Configuration Steps	Related Procedures and Topics
<p>Step 7</p> <p>If your routing rules from the route server state that a chaperone must monitor and/or record a call, configure chaperone functionality in Cisco Unified Communications Manager Administration.</p> <ul style="list-style-type: none"> • For phones where you want to enable recording, set the Built-in-Bridge to On in the Phone Configuration window. • Create a recording profile. Choose Device > Device Settings > Recording Profile, and create a Call Recording Profile for the phones that can record chaperoned conferences. • Apply the recording profile to the line appearance. • Add a SIP trunk to point to the recorder, and create a route pattern that points to the SIP Trunk. • Configure the Play Recording Notification Tone to Observed Target and Play Recording Notification Tone to Observed Connected Target service parameters. • Assign the Standard Chaperone Phone softkey template to the phone that the chaperone uses. • Make sure that the chaperone phone does not have shared lines or multiple directory numbers/lines configured for it. Configure only one directory number for the chaperone phone. (Call Routing > Directory Number or Device > Phone if the phone is already configured) • For the directory number on the chaperone phone, choose Device Invoked Call Recording Enabled from the Recording Option drop-down list box. (Call Routing > Directory Number or Device > Phone if the phone is already configured) • For the directory number on the chaperone phone, enter 2 for the Maximum Number of Calls setting, and enter 1 for the Busy Trigger setting. (Call Routing > Directory Number or Device > Phone if the phone is already configured) • For Cisco Unified IP Phones that support the Record softkey, make sure that the Standard Chaperone Phone softkey template is configured so that only the conference, record, and end call softkeys display on the phone in a connected state. • For Cisco Unified IP Phones that support the Record programmable line keys (PLK), configure the PLK in the Phone Button Template Configuration window. • If you have more than one chaperone in your cluster, add the chaperone DN to the chaperone line group that you plan to assign to the chaperone hunt list. Adding the chaperone to the line group, which belongs to the hunt list, ensures that an available chaperone monitors the call. 	<p>Chaperone Support for Routing Rules, page 22-9</p>

Table 22-1 External Call Control Configuration Checklist (continued)

Configuration Steps	Related Procedures and Topics
<p>Step 8</p> <p>If your routing rules require that an announcement get played for some calls and you do not want to use the Cisco-provided announcements, overwrite the Cisco-provided announcements with your customized announcements in the Announcements window. (Media Resources > Announcements)</p> <p>If you do not use the Cisco-provided announcements, configure annunciator so that you can use your customized announcements. (Media Resources > Annunciator)</p>	<p>Announcement Support for Routing Rules, page 22-10</p>

Introducing External Call Control for Cisco Unified Communications Manager

Cisco Unified Communications Manager, Release 8.0(2) (or higher), supports the external call control feature, which enables an adjunct route server to make call-routing decisions for Cisco Unified Communications Manager by using the 8.0(2) Cisco Unified Routing Rules Interface. When you configure external call control, Cisco Unified Communications Manager issues a route request that contains the calling party and called party information to the adjunct route server. The adjunct route server receives the request, applies appropriate business logic, and returns a route response that instructs Cisco Unified Communications Manager on how the call should get routed, along with any additional call treatment that should get applied.



Tip

Be aware that routing rules or business logic on the adjunct route server determine how the call is handled. If your configuration in Cisco Unified Communications Manager Administration conflicts with the routing rules, the routing rule gets used for the call.

In Cisco Unified Communications Manager Administration, you enable external call control on translation patterns by assigning a configured external call control profile to the translation pattern. The following example demonstrates how external call control works in your network:

1. Cisco Unified Communications Manager receives an incoming call, and the digit analysis engine in Cisco Unified Communications Manager selects the best matching translation pattern.
2. If you assigned a configured external call control profile to the translation pattern, Cisco Unified Communications Manager does not extend the call to the device. Instead, Cisco Unified Communications Manager sends a call-routing query by using XACML (eXtensible Access Control Markup Language) over http or https using the POST method to the route server.

Cisco Unified Communications Manager may include the calling number, transformed calling number, called number or dialed digits, transformed called number, and the trigger point information (string for translation pattern) in the query.

3. Routing rules and business logic on the route server determine how to route the call. The route server sends a call routing directive to Cisco Unified Communications Manager, and Cisco Unified Communications Manager follows the directive to handle the call. When the route server responds to Cisco Unified Communications Manager, the route server sends a XACML directive that consists of a route decision and an obligation. The route decision may include the following values for the decision:

- Permit—Call is allowed.
- Deny—Call is denied.
- Indeterminate—No call routing rule is determined. (usually related to a configuration issue)
- Not applicable—No call routing rule matches the request.

The obligation, which contain instructions that are specifically customized for Cisco Unified Communications Manager, gets encoded in Call Instruction XML (CIXML). The obligation must be consistent with the route decision. If it is not consistent, Cisco Unified Communications Manager obeys the route decision. Additionally, the obligation may contain parameters, which provide a reason code or additional tasks that Cisco Unified Communications Manager must perform when handling the call. [Table 22-2](#) describes the obligations and related parameters for the obligation.

Table 22-2 Obligations for External Call Control

Obligation	Description	Parameters for Obligation
Reject	<p>The adjunct route server may issue a Reject obligation for a Permit or Deny decision.</p> <p>Cisco Unified Communications Manager rejects the call, and the caller receives a fast busy tone.</p> <p>If the route decision is Deny and no obligation gets sent, Cisco Unified Communications Manager treats the call as if a Reject obligation is issued.</p>	<p>The reject obligation may contain the following parameters:</p> <ul style="list-style-type: none"> • Announce—Cisco Unified Communications Manager plays a specified announcement, identified by [id], to the caller that indicates that the call is rejected. • Reason—A string indicates why the call was rejected; the reason string is used for alarm and logging purposes. When the reason indicates that a route violation occurred, the alarm, <code>CallAttemptBlockedByPolicy</code>, gets raised for the event.
Continue	<p>The route decision must be Permit for the Continue obligation to be used. If the decision is Deny, then the obligation is ignored.</p> <p>Cisco Unified Communications Manager routes the call to the current destination; that is, Cisco Unified Communications Manager manipulates the digits as expected and routes the call.</p> <p>Modified calling/called numbers in the continue obligation override the result of the transformation on the translation pattern and may change the destination of the call.</p> <p>If the adjunct route server issues a Permit decision and no obligation gets sent, Cisco Unified Communications Manager treats the call as if a Continue obligation is issued.</p>	<p>The continue obligation may contain the following parameters, which are optional:</p> <ul style="list-style-type: none"> • Greeting—Cisco Unified Communications Manager plays an announcement, identified by [id], to the caller before connecting the caller to the called party. • Modify—The adjunct route server overwrites the calling and called party transformation that is configured for the translation pattern. Cisco Unified Communications Manager changes the calling or called number(s) to the numbers that are provided in the directive. If the number is not included in the directive, the configuration for the route pattern or translation pattern applies.

Table 22-2 *Obligations for External Call Control (continued)*

Obligation	Description	Parameters for Obligation
Divert	<p>The route decision must be Permit for the Divert obligation to be used.</p> <p>Cisco Unified Communications Manager redirects the call to another destination, which is represented by the destination parameter, a mandatory parameter of the divert obligation.</p> <p>Call diversions by the adjunct route server may result in multiple diversion hops or a diversion loop. To control the number of hops or to prevent diversion hops, configure the Maximum External Call Control Diversion Hops to Pattern or DN or External Call Control Diversion Maximum Hop Count service parameters, as described in the “Service Parameters for External Call Control” section on page 22-13.</p>	<p>The divert obligation may contain the following parameters:</p> <ul style="list-style-type: none"> • Destination (mandatory parameter)—Cisco Unified Communications Manager diverts the call to the provided number or to the voice mailbox of the original called party. • Reason—The reason indicates that a chaperone must monitor and/or record the call. • Modify—For the current hop of the call, the adjunct route server includes updated calling or called numbers. If the number is not included in the directive, the configuration for the route pattern or translation pattern applies. Be aware that updated numbers may display on the phone, and the modified values get written to the CDRs. • Reset Call History—Cisco Unified Communications Manager redirects the call, and the last or all previous call hops get deleted from the call history.

Cisco Unified Communications Manager Connections to the Adjunct Route Server(s)

Cisco Unified Communications Manager maintains persistent connections to the adjunct route server to reduce delays with call setup. Each node in a Cisco Unified Communications Manager cluster may establish multiple connections to the adjunct route server for parallel/simultaneous queries at a high call rate. Cisco Unified Communications Manager manages a thread pool for the persistent connections, which is determined by the configuration for the following service parameters:

- External Call Control Initial Connection Count To PDP—This parameter specifies the minimum number of connections that Cisco Unified Communications Manager establishes to a adjunct route server for handling call routing requests.
- External Call Control Maximum Connection Count To PDP—This parameter specifies the maximum number of connections that Cisco Unified Communications Manager establishes to a adjunct route server for handling call routing requests.

For more information on these and other external call control service parameters, see the [“Service Parameters for External Call Control”](#) section on page 22-13.

External Call Control Profiles

In Cisco Unified Communications Manager Administration, you enable external call control by assigning a configured external call control profile to the translation pattern. The translation pattern is the trigger point for external call control; that is, if the translation pattern has an external call control profile assigned to it, when the called number on the call matches the translation pattern, Cisco Unified Communications Manager immediately sends a call-routing query to an adjunct route server, and the adjunct route server directs Cisco Unified Communications Manager on how to handle the call.

The external call control profile provides the URIs for a primary and redundant adjunct route server (called the web service in the GUI), a calling search space that is used for diverting calls, a timer that indicates how long Cisco Unified Communications Manager waits for a response from the adjunct route server, and so on.

In the external call control profiles that you configure in Cisco Unified Communications Manager Administration, you must provide the URI(s) for the adjunct route server(s) that provides the route decisions and obligations to the Cisco Unified Communications Manager. If you want to do so, you can configure one URI, known as the primary web service in Cisco Unified Communications Manager Administration, or you can configure primary and secondary URIs to create active and standby links to the adjunct route server(s). If you configure primary and secondary URIs, the route servers can load balance the call-routing queries in a round robin fashion. For the URIs, you can use http or https. If you specify https, Cisco Unified Communications Manager uses certificates to mutually authenticate via a TLS connection to the adjunct route server.

**Tip**

If you use https, Cisco Unified Communications Manager verifies that the certificate subject name matches the hostname of the adjunct route server. Additionally, Cisco Unified Communications Manager verifies whether the signature of the certificate is issued by a trusted CA or if the signature matches a self-signed, imported certificate in the trusted store.

To establish https connections, you must import certificates from each adjunct route server into the trusted store on each Cisco Unified Communications Manager node. Likewise, you must export a self-signed certificate from each Cisco Unified Communications Manager node and import it to the trusted store on each adjunct route server. For more information on these tasks, see the [“External Call Control Profile Configuration Settings”](#) section on page 22-15 and the [“Generating a Cisco Unified Communications Manager Self-Signed Certificate For Export”](#) section on page 22-22.

If Cisco Unified Communications Manager must redirect a call because the adjunct route server issues a divert routing directive, the configuration for the Diversion Rerouting CSS gets used.

In the external call control profile, you can configure the time that Cisco Unified Communications Manager waits for a response from the adjunct route server. If the timer expires, Cisco Unified Communications Manager either allows or blocks the call, based on how you configured the Call Treatment on Failure setting in the external call control profile.

Chaperone Support for Routing Rules

If routing rules from the adjunct route server state that a chaperone must be present on a call, you must configure chaperone support in Cisco Unified Communications Manager Administration. In this case, the adjunct route server sends the following routing directive to Cisco Unified Communications Manager:

- Permit decision
- Divert obligation that contains reason = chaperone.

A chaperone is a designated phone user who can announce company policies to the call, monitor the call, and record the call, if required. Cisco Unified Communications Manager provides the following capabilities to support chaperone functionality, as directed by the adjunct route server:

- Cisco Unified Communications Manager can redirect an incoming call to a chaperone or hunt group/list of chaperones.
- Cisco Unified Communications Manager can provide a chaperone with the ability to record a call.

When the chaperone is connected to the caller or when the chaperoned conference is established, the Record softkey or PLK (depending on the phone model) becomes active on the phone so that the chaperone can invoke call recording. Call recording occurs for the current call only, and call recording stops when the current call ends. Messages that indicate the status of recording may display on the phone when the chaperone presses the recording softkey/PLK.



Tip

For a list of configuration tasks that you must perform in Cisco Unified Communications Manager Administration to set up chaperone support, see the [“Configuration Checklist for External Call Control” section on page 22-2](#).

Chaperone restrictions exist so that the parties that are involved in the call cannot converse without the presence of the chaperone. The following restrictions exist for chaperones:

- The chaperone cannot use the phone to put the conference call on hold.
- The chaperone cannot use the phone to add parties to a conference after the conference begins because the call must be put on hold for the chaperone to add parties.

After the chaperone creates a conference, the conference softkey gets disabled on the phone; that is, if the phone uses the conference softkey.

Be aware that the other parties on the conference may be able to add additional parties to the conference. The configuration for the Advanced Ad Hoc Conference Enabled service parameter, which supports the Cisco CallManager service, determines whether other parties can add participants to the conference. If the service parameter is set to True, other parties can add participants to the conference.

- The chaperone cannot use the phone to transfer the conference call to another party.
- When the chaperone leaves the conference, the entire conference drops.
- If the chaperone starts recording before making a consultative call to the party that should join the conference, Cisco Unified Communications Manager suspends recording while the chaperone makes the consultative call; recording resumes after the conference is established.

Announcement Support for Routing Rules

Routing rules on the adjunct route server may require that Cisco Unified Communications Manager play an announcement for the call; for example, an announcement that states that the call is rejected or an announcement that issues a greeting to the caller before connecting the caller to the called party. When you install Cisco Unified Communications Manager, Cisco-provided announcements and tones install, and the Find and Lists Announcements window in Cisco Unified Communications Manager Administration displays these announcements and tones, which can be used for external call control. (**Media Resources > Announcements**) All announcements that display in the window support external call control, but the obligation that the adjunct route server issues determines which announcement Cisco Unified Communications Manager plays; for example, the obligation from the adjunct route server indicates that Cisco Unified Communications Manager must reject the call and play the Custom_05006 announcement.



Tip

If you want to use customized announcements, not the Cisco-provided announcements, you can upload the customized announcements in the Announcements Configuration window.

For More Information

[Announcement Configuration](#), *Cisco Unified Communications Manager Administration Guide*

System Requirements for External Call Control

The following system requirements exist for external call control:

- Cisco Unified Communications Manager 8.0(2) (or higher)
- Cisco Unified Routing Rules XML Interface, which provides the route decisions and obligation for the calls

Interactions and Restrictions

Annunciator

If your routing rules require that an announcement get played for calls, upload or customize the standard announcements in the Announcements window; that is, if you do not want to use the Cisco-provided announcements. (**Media Resources > Announcements**)

In you upload customized announcements, configure annunciator so that you can use the announcements. (**Media Resources > Annunciator**)

Best Call Quality Routing for Cisco Unified Communications Manager Calls

If you want to do so, you can set up routing rules on the adjunct route server that determine which gateway should be used for a call when voice quality is a consideration; for example, gateway A provides the best voice quality, so it gets used for the call. In this case, the adjunct route server monitors network link availability, bandwidth usage, latency, jitter, and MOS scores to ensure calls are routed through voice gateways that deliver the best voice quality to all call participants.

Call Detail Records

External call control functionality can display in call detail records; for example, the call detail record can indicate whether the adjunct route server permitted or rejected the call. In addition, the call detail record can indicate whether Cisco Unified Communications Manager blocked or allowed calls when Cisco Unified Communications Manager did not receive a decision from the adjunct route server. For more information on call detail records and external call control, see the *Cisco Unified Communications Manager Call Detail Records Administration Guide*.

Call Forward

External call control intercepts calls at the translation pattern level, while call forward intercepts calls at the directory number level. External call control has higher priority; that is, for calls that where call forward is invoked, Cisco Unified Communications Manager sends a routing query to the adjunct route server if the translation pattern has an external call control profile assigned to it. Call forwarding gets triggered only when the adjunct route server sends a Permit decision with a Continue obligation to the Cisco Unified Communications Manager.

Be aware that the call diversion hop count service parameter that supports external call control and the call forward call hop count service parameter that supports call forwarding are independent; that is, they work separately.

Call Pickup

When Cisco Unified Communications Manager recognizes that a phone user is trying to pick up a call by using the call pickup feature, external call control does not get invoked; that is, Cisco Unified Communications Manager does not send a routing query to the adjunct route server for that portion of the call.

Chaperones

A chaperone is a designated phone user who can announce company policies to the call, monitor the call, and record the call, if required. Chaperone restrictions exist so that the parties that are involved in the call cannot converse without the presence of the chaperone. For chaperone restrictions, see the [“Chaperone Support for Routing Rules” section on page 22-9](#).

Cisco Unified Mobility

Cisco Unified Communications Manager honors the route decision from the adjunct route server for the following Cisco Unified Mobility features:

- Mobile Connect
- Mobile Voice Access
- Enterprise Feature Access
- Dial-via-Office Reverse Callback
- Dial-via-Office Forward



Tip

To invoke Mobile Voice Access or Enterprise Feature Access, the end user must dial a feature directory number that is configured in Cisco Unified Communications Manager Administration. When the Cisco Unified Communications Manager receives the call, Cisco Unified Communications Manager does not invoke external call control because the called number, in this case, is the feature DN. After the call is anchored, the Cisco Unified Communications Manager asks for user authentication, and the user enters the number for the target party. When Cisco Unified Communications Manager tries to extend the call to the target party, external call control gets invoked, and Cisco Unified Communications Manager sends a call routing query to the adjunct route server to determine how to handle the call.

Cisco Unified Communications Manager does not send a routing query for the following Cisco Unified Mobility features:

- Cell pickup
- Desk pickup
- Session handoff

Cisco Unified Serviceability

Alarm definitions for external call control display in Cisco Unified Serviceability under the Cisco CallManager alarm catalog. For information on the alarm definitions, see the *Troubleshooting Guide for Cisco Unified Communications Manager*.

Conferences

When a phone user creates a conference, external call control may get invoked for the primary call and consultative call.

Directory Numbers

When you configure directory numbers as 4- or 5- digit extensions (enterprise extensions), you need to configure 2 translation patterns if on-net dialing supports 4 or 5 digits. One translation pattern supports globalizing the calling/called numbers, and a second translation pattern supports localizing the calling/called numbers. Assign external call control profile on the translation pattern that is used for globalizing the calling/called numbers.

Do Not Disturb

By default, the DND setting for the user takes effect when the user rule on the adjunct route server indicates that the adjunct route server send a continue obligation. For example, if the adjunct route server sends a continue obligation, and the user has DND-R enabled, Cisco Unified Communications Manager rejects the call.

Emergency Call Handling (for example, 911 or 9.11)



Caution

Cisco strongly recommends that you configure a very explicit set of patterns for emergency calls (for example, 911 or 9.911) so that the calls route to their proper destination (for example, to Cisco Emergency Responder or a gateway) without having to contact the route server for instructions on how to handle the call.

For example, if you configure your system so that all calls that originate from a group of phones use the external call control feature, all calls, including emergency calls, get routed to the route server. In this case, how the calls get handled depends on the rules configuration on the route server. If the route server does not issue a Permit directive (or if the route server does not have a rule or business logic for handling emergency calls), an emergency call may be denied (or there may be a delay in processing the call).

Real Time Monitoring Tool

For external call control, performance monitoring counters display under the External Call Control object and the Cisco CallManager object in RTMT. For information on these counters, see the *Troubleshooting Guide for Cisco Unified Communications Manager*.

Transfer

When a phone user transfers a call, external call control may get invoked for both the primary call and consultative call. However, Cisco Unified Communications Manager cannot enforce any routing rules from the adjunct route server between the party that transfers and the target of the transfer.

Installing and Activating External Call Control

After you install Cisco Unified Communications Manager, your network can support external call control if you perform the necessary configuration tasks. For information on configuration tasks that you must perform, see the “[Configuration Checklist for External Call Control](#)” section on page 22-2.

Configuring External Call Control

This section contains information on the following topics:

- [Service Parameters for External Call Control](#), page 22-13
- [External Call Control Profile Configuration Settings](#), page 22-15
- [Finding Configuration Records for External Call Control Profiles](#), page 22-19
- [Configuring an External Call Control Profile](#), page 22-20
- [Assigning the External Call Control Profile to the Translation Pattern](#), page 22-21
- [Deleting Configuration Records for External Call Control Profiles](#), page 22-21
- [Importing the Adjunct Route Server Certificate](#), page 22-22
- [Generating a Cisco Unified Communications Manager Self-Signed Certificate For Export](#), page 22-22



Tip

Before you configure external call control, review the “[Configuration Checklist for External Call Control](#)” section on page 22-2.

Service Parameters for External Call Control

To access the service parameters that support the external call control feature, choose **System > Service Parameters**. Choose the server and the **Cisco CallManager** service. Then, locate the **Clusterwide Parameters (Feature - External Call Control)** pane. [Table 22-3](#) describes the service parameters for the external call control feature. For additional information, you can click the question mark help in the Service Parameters window.

Table 22-3 External Call Control Service Parameters

Service Parameter	Description
External Call Control Diversion Maximum Hop Count	This parameter specifies the maximum number of times the adjunct route server can issue a divert obligation for a single call. The default equals 12. The minimum value is 1, and the maximum value is 500.
Maximum External Call Control Diversion Hops to Pattern or DN	This parameter specifies the maximum number of times that the adjunct route server can issue the divert obligation for a call to a directory number, route pattern, translation pattern, or hunt pilot. The default is 12; the minimum is 1, and the maximum is 60.
External Call Control Routing Request Timer	This parameter specifies the maximum time, in milliseconds, that Cisco Unified Communications Manager should wait for the call routing directive from the adjunct route server before allowing or blocking the call, as configured in the Call Treatment on Failures setting in the external call control profile. The default is 2000; the minimum value is 1000, and the maximum value is 5000.
External Call Control Fully Qualified Role And Resource	This parameter specifies the fully qualified role and the resource that Cisco Unified Communications Manager sends to the adjunct route server in the XACML call routing request. The value that you enter matches your configuration on the adjunct route server, and it ensures that the Cisco Unified Communications Manager query points to the correct routing rules on the adjunct route server. The default equals CISCO:UC:UCMPolicy:VoiceOrVideoCall, where CISCO:UC:UCMPolicy represents the role on the adjunct route server and VoiceOrVideoCall represents the resource on the adjunct route server. You can enter up to 100 characters, which include alphanumeric characters (A-Z,a-z,0-9) or colons (:). Colons are only allowed between alphanumeric characters.

Table 22-3 External Call Control Service Parameters (continued)

Service Parameter	Description
External Call Control Initial Connection Count To PDP	<p>This parameter specifies the initial number of connections that Cisco Unified Communications Manager establishes to a adjunct route server for handling call routing requests. Ensure that the value for this parameter is less than or equal to the External Call Control Maximum Connection Count To PDP value. If it is not less than or equal to the External Call Control Maximum Connection Count To PDP value, the External Call Control Maximum Connection Count To PDP value gets ignored. This setting applies to each URI that is configured in each external call control profile.</p> <p>The default is 2; the minimum value is 2, and the maximum value is 20.</p>
External Call Control Maximum Connection Count To PDP	<p>This parameter specifies the maximum number of connections that Cisco Unified Communications Manager establishes to a adjunct route server for handling call routing requests. Ensure that the value for this parameter is greater than or equal to the External Call Control Initial Connection Count To PDP value. If it is not greater than the External Call Control Initial Connection Count To PDP value, the value gets ignored. This setting applies to each URI that is configured in each external call control profile.</p> <p>The default is 4; the minimum value is 2, and the maximum value is 20.</p>

External Call Control Profile Configuration Settings

Cisco Unified Communications Manager, Release 8.0(2) (or higher), supports the external call control feature, which enables an adjunct route server to make call-routing decisions for Cisco Unified Communications Manager by using the 8.0(2) Cisco Unified Routing Rules Interface. When you configure external call control, Cisco Unified Communications Manager issues a route request that contains the calling party and called party information to the adjunct route server. The adjunct route server receives the request, applies appropriate business logic, and returns a route response that instructs Cisco Unified Communications Manager on how the call should get routed, along with any additional call treatment that should get applied.

The adjunct route server can instruct Cisco Unified Communications Manager to allow, divert, or deny the call, modify calling and called party information, play announcements to callers, reset call history so adjunct voicemail and IVR servers can properly interpret calling/called party information, and log reason codes that indicate why calls were diverted or denied.

The external call control profile provides the URI(s) for the adjunct route server(s), a calling search space that is used for diverting calls, a timer that indicates how long Cisco Unified Communications Manager waits for a response from the adjunct route server, and so on.

Table 22-4 describes the settings that display in the External Call Control Profile window (**Call Routing > External Call Control Profile**).

Before You Begin

Before you configure the external call control profile, configure a calling search space that Cisco Unified Communications Manager uses when the adjunct route server sends a divert obligation to Cisco Unified Communications Manager. (**Call Routing > Class of Control > Calling Search Space**)

Before you configure the external call control profile, review the “[Configuration Checklist for External Call Control](#)” section on page 22-2.

Next Step

After you configure the external call control profile, assign the profile to the translation pattern. (**Call Routing > Translation Pattern**)

Table 22-4 External Call Control Profile Configuration Settings

Field	Description
Name	<p>Enter the name of the external call control profile. Valid entries include alphanumeric characters, hyphen, period, underscore, and blank spaces.</p> <p>The name that you enter displays in the Find and List External Call Control Profile window and in the External Call Control Profile drop-down list box in the Translation Pattern Configuration window.</p>
Primary Web Service	<p>Enter the URI for the primary adjunct route server, which is the adjunct route server where Cisco Unified Communications Manager sends routing queries to determine how to handle the call.</p> <p>You can enter http or https in this field. If you enter https, you must import a self-signed certificate from the adjunct route server, and you must export a Cisco Unified Communications Manager self-signed certificate to the adjunct route server.</p> <p>Enter the URI by using the following formula: https://<hostname or IPv4 address of primary route server>:<port that is configured on primary route server>/path from route server configuration</p> <p>For example, enter https://primaryrouteserver:8443/pdp/AuthenticationEndPoint</p> <p>If you use https, make sure that you enter the hostname that exists in the certificate in this field. (for example, the CN or Common Name in the certificate)</p>

Table 22-4 External Call Control Profile Configuration Settings (continued)

Field	Description
Secondary Web Service	<p>Enter the URI for the redundant adjunct route server, which is the redundant adjunct route server where Cisco Unified Communications Manager sends routing queries to determine how to handle the call. The secondary web service is optional and gets used for load balancing between the primary and secondary route servers if you check the Enable Load Balancing check box. Configuring a secondary web service also ensures redundancy; that is, that an active/standby link is available.</p> <p>You can enter http or https in this field. If you enter https, you must import a self-signed certificate from the adjunct route server, and you must export a Cisco Unified Communications Manager self-signed certificate to the adjunct route server. If you use https, make sure that you enter the hostname that exists in the certificate in this field.</p> <p>Enter the URI by using the following formula:</p> <p>https://<hostname or IPv4 address of secondary route server>:<port that is configured on secondary route server>/path from route server configuration</p> <p>For example, enter https://secondaryrouteserver:8443/pdp/AuthenticationEndPoint</p> <p>If you use https, make sure that you enter the hostname that exists in the certificate in this field (for example, the CN or Common Name in the certificate)</p>
Enable Load Balancing	<p>If you want load balancing to occur between the primary and redundant adjunct route server, check this check box. If checked, load balancing occurs in a round robin fashion.</p>

Table 22-4 External Call Control Profile Configuration Settings (continued)

Field	Description
Routing Request Timer	<p>This parameter specifies the maximum time, in milliseconds, that Cisco Unified Communications Manager should wait for the call routing directive from the adjunct route server before allowing or blocking the call, as configured in the Call Treatment on Failures setting in the external call control profile.</p> <p>The default is 2000; the minimum value is 1000, and the maximum value is 5000.</p> <p>If this field is left blank, Cisco Unified Communications Manager uses the configuration for the External Call Control Routing Request Timer service parameter, which supports the Cisco CallManager service.</p>
Diversion Rerouting Calling Search Space	<p>From the drop-down list box, choose the calling search space that Cisco Unified Communications Manager uses when the adjunct route server sends a divert obligation to Cisco Unified Communications Manager.</p>
Call Treatment on Failure	<p>From the drop-down list box, choose whether Cisco Unified Communications Manager allows or blocks calls under the following circumstances:</p> <ul style="list-style-type: none"> • When the adjunct route server does not send the call routing directive to Cisco Unified Communications Manager • When Cisco Unified Communications Manager cannot contact the adjunct route server • When Cisco Unified Communications Manager fails to parse the routing directive (or supplements of the routing directive) • When Cisco Unified Communications Manager receives a 4xx or 5xx message from the adjunct route server <p>Choosing Allow Calls routes the call to the current destination, as if the adjunct route server issued a Permit decision with Continue obligation.</p> <p>Choosing Block Calls causes Cisco Unified Communications Manager to clear the call, as if the adjunct route server issued a Deny decision with a Reject obligation.</p> <p>When failure occurs, an alarm gets logged.</p>

Finding Configuration Records for External Call Control Profiles

Cisco Unified Communications Manager supports the external call control feature, which enables an adjunct route server to make call-routing decisions for Cisco Unified Communications Manager by using the 8.0(2) Cisco Unified Routing Rules Interface. When you configure external call control, Cisco Unified Communications Manager issues a route request that contains the calling party and called party information to the adjunct route server. The adjunct route server receives the request, applies appropriate business logic, and returns a route response that instructs Cisco Unified Communications Manager on how the call should get routed, along with any additional call treatment that should get applied.

The adjunct route server can instruct Cisco Unified Communications Manager to allow, divert, or deny the call, modify calling and called party information, play announcements to callers, reset call history so adjunct voicemail and IVR servers can properly interpret calling/called party information, and log reason codes that indicate why calls were diverted or denied.

**Tip**

Be aware that routing rules and business logic on the adjunct route server determine how the call is handled. If your configuration in Cisco Unified Communications Manager Administration conflicts with the routing rule, the routing rule gets used for the call.

To locate external call control profiles in Cisco Unified Communications Manager Administration, perform the following procedure:

Procedure

Step 1 From Cisco Unified Communications Manager Administration, choose **Call Routing > External Call Control Profile**.

Step 2 The Find and List window displays. Records from an active (prior) query may also display in the window.

Step 3 To find all records in the database, ensure the dialog box is empty; go to [Step 4](#).

To filter or search records

- From the first drop-down list box, select a search parameter.
- From the second drop-down list box, select a search pattern.
- Specify the appropriate search text, if applicable.

**Note**

To add additional search criteria, click the + button. When you add criteria, the system searches for a record that matches all criteria that you specify. To remove criteria, click the – button to remove the last added criterion or click the **Clear Filter** button to remove all added search criteria.

Step 4 Click **Find**.

All matching records display. You can change the number of items that display on each page by choosing a different value from the Rows per Page drop-down list box.

**Note**

You can delete multiple records from the database by checking the check boxes next to the appropriate record and clicking **Delete Selected**. You can delete all configured records for this selection by clicking **Select All** and then clicking **Delete Selected**.

Step 5 From the list of records that display, click the link for the record that you want to view.



Note To reverse the sort order, click the up or down arrow, if available, in the list header.

The window displays the item that you choose.

Additional Information

See the “[Related Topics](#)” section on page 22-23.

Configuring an External Call Control Profile

External call control, which is a rules-based routing feature, requires that Cisco Unified Communications Manager send call-routing queries to an adjunct route server before routing the call. Routing rules that are set on the adjunct route server determine how the call gets handled. The adjunct route server uses the Cisco Unified Routing Rules XML interface to communicate with Cisco Unified Communications Manager. After the adjunct route server receives the query from Cisco Unified Communications Manager, the adjunct route server directs Cisco Unified Communications Manager on how to handle the call.



Tip

Be aware that routing rules and business logic on the adjunct route server determine how the call is handled. If your configuration in Cisco Unified Communications Manager Administration conflicts with the routing rule, the routing rule gets used for the call.

The external call control profile provides the URIs for the adjunct route server(s), a calling search space that is used for diverting calls, a timer that indicates how long Cisco Unified Communications Manager waits for a response from the adjunct route server, and so on.

Before You Begin

Before you configure the external call control profile, configure a calling search space that Cisco Unified Communications Manager uses when the adjunct route server sends a divert obligation to Cisco Unified Communications Manager.

Procedure

Step 1 From Cisco Unified Communications Manager Administration, choose **Call Routing > External Call Control Profile**.

Step 2 From the Find and List window, perform one of the following tasks:

- To copy an existing record related to external call control profiles, locate the record as described in the “[Finding Configuration Records for External Call Control Profiles](#)” section on page 22-19, click the **Copy** button next to the record that you want to copy, and continue with [Step 3](#).
- To add a new external call control profile, click the **Add New** button and continue with [Step 3](#).
- To update an existing external call control profile, locate the appropriate record as described in the “[Finding Configuration Records for External Call Control Profiles](#)” section on page 22-19 and continue with [Step 3](#).

- Step 3** Configure the appropriate fields, as described in [Table 22-4](#).
- Step 4** To save the configuration information to the database, click **Save**.
-

Next Step

Assign the external call control profile to the translation pattern.

Additional Information

See the “[Related Topics](#)” section on page 22-23.

Assigning the External Call Control Profile to the Translation Pattern

To assign the external call control profile to the translation pattern in Cisco Unified Communications Manager Administration, choose **Call Routing > Translation Pattern**. In the Translation Pattern Configuration window, choose the external call control profile that you want to assign to the pattern from the External Call Control Profile drop-down list box.

Deleting Configuration Records for External Call Control Profiles

This section describes how to delete a configured external call control profile in Cisco Unified Communications Manager Administration.

**Note**

You can delete multiple records from the Find and List window by checking the check boxes next to the appropriate records and clicking **Delete Selected**. You can delete all records in the window by clicking **Select All** and then clicking **Delete Selected**.

Before You Begin

Before you can delete the external call control profile, you must unassign the profile from the translation pattern(s) that refer(s) to it. If you attempt to delete a profile that is assigned to a translation pattern, an error message displays in Cisco Unified Communications Manager Administration.

Procedure

- Step 1** If you want to delete the record from the Find and List window, perform the following tasks:
- Find the record that you want to delete by using the procedure in the “[Finding Configuration Records for External Call Control Profiles](#)” section on page 22-19.
 - Click the record that you want to delete.
 - Click **Delete Selected**.
You receive a message that asks you to confirm the deletion.
 - Click **OK**.
The window refreshes, and the record gets deleted from the database.

- Step 2** If you want to delete the record from the configuration window, perform the following tasks:
- a. Find the record that you want to delete by using the procedure in the [“Finding Configuration Records for External Call Control Profiles”](#) section on page 22-19.
 - b. Access the configuration window; click **Delete** in the configuration window.
You receive a message that asks you to confirm the deletion.
 - c. Click **OK**.
The window refreshes, and the record gets deleted from the database.
-

Additional Information

See the [“Related Topics”](#) section on page 22-23.

Importing the Adjunct Route Server Certificate

If you specify https for the primary or secondary web service URIs in the external call control profile in Cisco Unified Communications Manager Administration, Cisco Unified Communications Manager uses certificates to mutually authenticate via a TLS connection to the adjunct route server(s).

To import the self-signed certificate for the adjunct route server into the Cisco Unified Communications Manager trusted store, perform the following procedure:

Procedure

- Step 1** In Cisco Unified Communications Operating System, choose **Security > Certificate Management**.
 - Step 2** In the Certificate List window, click **Upload Certificate**.
 - Step 3** When the Upload Certificate popup window displays, choose CallManager-trust from the Certificate Name drop-down list box, and browse to the certificate for the adjunct route server; after the certificate displays in the Upload File field, click the **Upload File** button.
 - Step 4** Perform this procedure again if Cisco Unified Communications Manager can contact a redundant adjunct route server.
-

Generating a Cisco Unified Communications Manager Self-Signed Certificate For Export

To ensure that the primary and redundant route servers can authenticate with Cisco Unified Communications Manager through https, you must generate a self-signed certificate that you can import to each adjunct route server that sends directives to Cisco Unified Communications Manager.

You do not need to perform this procedure if the adjunct route server uses http, as indicated in the external call control profile in Cisco Unified Communications Manager Administration.

To generate a Cisco Unified Communications Manager self-signed certificate that you can export to adjunct route server, perform the following procedure:

Procedure

-
- Step 1** In Cisco Unified Communications Operating System, choose **Security > Certificate Management**.
- Step 2** In the Certificate List window, click **Generate New**.
- Step 3** From the Certificate Name drop-down list box, choose **CallManager**; then, click **Generate New**.
- Step 4** From the Find and List Certificates window, click the **CallManager.pem** certificate that you just created.
- Step 5** After the certificate file data displays, click **Download** to download the certificate to a location that you can use for exporting the certificate to the adjunct route server.
- Step 6** Export the certificate to each adjunct route server that sends directives.
- Step 7** Perform this task for each node in the Cisco Unified Communications Manager cluster that can contact the primary and redundant adjunct route server.
-

Providing Information to End Users

Because limitations and restrictions exist for chaperones, notify users that you designated as chaperones.

Troubleshooting External Call Control

For information on troubleshooting external call control, see the *Troubleshooting Guide for Cisco Unified Communications Manager*.

Related Topics

- [Configuration Checklist for External Call Control, page 22-2](#)
- [Introducing External Call Control for Cisco Unified Communications Manager, page 22-5](#)
- [System Requirements for External Call Control, page 22-10](#)
- [Interactions and Restrictions, page 22-10](#)
- [Installing and Activating External Call Control, page 22-13](#)
 - [Configuring External Call Control, page 22-13](#)
 - [Service Parameters for External Call Control, page 22-13](#)
 - [External Call Control Profile Configuration Settings, page 22-15](#)
 - [Finding Configuration Records for External Call Control Profiles, page 22-19](#)
 - [Configuring an External Call Control Profile, page 22-20](#)
 - [Assigning the External Call Control Profile to the Translation Pattern, page 22-21](#)
 - [Deleting Configuration Records for External Call Control Profiles, page 22-21](#)
 - [Importing the Adjunct Route Server Certificate, page 22-22](#)
 - [Generating a Cisco Unified Communications Manager Self-Signed Certificate For Export, page 22-22](#)

- [Providing Information to End Users](#), page 22-23
- [Troubleshooting External Call Control](#), page 22-23
- [Announcement Configuration](#), *Cisco Unified Communications Manager Administration Guide*