URI Dialing

Cisco Unified Communications Manager supports dialing using directory URIs for call addressing. Directory URIs look like email addresses and follow the username@host format where the host portion is an IPv4 address or a fully qualified domain name. A directory URI is a uniform resource identifier, a string of characters that can be used to identify a directory number. If that directory number is assigned to a phone, Cisco Unified Communications Manager can route calls to that phone using the directory URI. URI dialing is available for SIP and SCCP endpoints that support directory URIs.

This chapter contains the following topics:

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Set Up URI Dialing

The following steps describe how to set up URI dialing in your network:
Procedure

Step 1 Assign directory URIs to the users in your network.

Step 2 Associate the directory URIs to directory numbers by assigning both a primary extension and phone to the users in your network.

Step 3 Assign the default directory URI partition to an existing partition that is located in a calling search space by doing the following:

a) In Cisco Unified CM Administration, choose **System > Enterprise Parameters**

b) For the Directory URI Alias Partition enterprise parameter, choose an existing partition that is in an existing calling search space.

c) Set the **URI Dialing Display Preference** service parameter for URI dialing as **URI** for calling display in call park display URI of the calling party. **DN** is the default setting for the service parameter.

Step 4 Configure the SIP profiles in your network by configuring the following fields in the SIP Profile Configuration window:

- Configure a setting for the Dial String Interpretation drop-down list box and apply the setting for all the SIP profiles in your network.

- Check the **Use Fully Qualified Domain Name in SIP Requests** check box for all the SIP profiles in your network.

Note At this point, intracluster URI dialing is configured. The remaining steps are used to configure intercluster URI dialing.

Step 5 For all the SIP trunks in your network, configure whether the network uses blended addressing by configuring the Calling and Connected Party Info Format drop-down list box in the Trunk Configuration window.

Step 6 Set up ILS on all the clusters in your network.

Step 7 Enable intercluster URI dialing with ILS by checking the **Exchange Directory URI Catalogs with Remote Clusters** check box in the Intercluster Directory URI Configuration window.

Step 8 In the Intercluster Directory URI Configuration window, create a route string that remote clusters will use to route to this cluster.

Step 9 Configure SIP route patterns that match the route strings for the remote clusters in your ILS network.

Step 10 Associate the SIP route patterns that you created to an outbound SIP trunk or route list.

Step 11 If you are connecting your ILS network to a Cisco TelePresence Video Communications Server, or a third-party call control system, import directory URI catalogs from the other system into Cisco Unified Communications Manager.

Step 12 If your deployment uses digit transformations to transform calling party directory numbers, configure calling party transformation patterns and apply them to the Inbound Call Settings for the phone or device pool. This configuration is used for intercluster calls.

Step 13 If you applied digit transformation patterns in the previous step, configure calling party transformation patterns for the Outbound Call Settings for the phone or device pool. This configuration is used for intracluster calls.

Related Topics

- **Directory URI and Directory Number Dial String Interpretation**, on page 4
- **Set Up Global Dial Plan Replication**
- **Set Up ILS Network**
Directory URI Format

Directory URIs are alphanumeric strings consisting of a user and a host address separated by the @ symbol. Cisco Unified Communications Manager supports the following formats for directory URIs:

- user@domain (for example, joe@cisco.com)
- user@ip_address (for example, joe@10.10.10.1)

Cisco Unified Communications Manager supports the following formats in the user portion of a directory URI (the portion before the @ symbol):

- Accepted characters are a-z, A-Z, 0-9, !, $, %, &, *, +, -, =, _, ~, -, /.
- The user portion has a maximum length of 47 characters.
- The user portion accepts percent encoding from %2[0-9A-F] through %7[0-9A-F]. For some accepted characters, Unified CM automatically applies percent encoding. See below for more information on percent encoding.
- The user portion is case-sensitive.

Cisco Unified Communications Manager supports the following formats in the host portion of a directory URI (the portion after the @ symbol):

- Supports IPv4 addresses or fully qualified domain names.
- Accepted characters are a-z, A-Z, 0-9, hyphens, and dots.
- The host portion cannot start or end with a hyphen.
- The host portion cannot have two dots in a row.
- Minimum of two characters.
- The host portion is not case sensitive.

Due to database restrictions, the Directory URI field has a maximum length of 254 characters.

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**Note**

You can also enter a directory number in the user portion of a directory URI. However, Cisco Unified Communications Manager may treat the directory URI as a directory number depending on which Dial String Interpretation option you choose for the SIP Profile.

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**Note**

For compatibility with third-party call control systems, we recommend using lower case for directory URIs.
Percent Encoding of Directory URIs

In the user portion of a directory URI, Unified CM automatically applies percent encoding to the following characters when the directory URI is saved in the database:

# % ^ ` {} | \ : " < > [ ] \ ' and spaces

When percent encoding is applied, the digit length of the directory URI increases. For example, if you input joe smith#@cisco.com (20 characters) as a directory URI, Cisco Unified Communications Manager stores the directory URI in the database as joe%20smith%23@cisco.com (24 characters). Due to database restrictions, Cisco Unified Communications Manager rejects any attempt to save a directory URI of greater than 254 characters.

Directory URI Format Exception for Bulk Administration

Within Cisco Unified CM Administration, you can enter directory URIs with embedded double quotes or commas. However, when you use Bulk Administration to import a CSV file that contains directory URIs with embedded double quotes and commas, you must use enclose the entire directory URI in double quotes and escape the embedded double quotes with a double quote. For example, the Jared, "Jerry".Smith@test.com directory URI must be input as "Jared,""Jerry"",Smith@test.com" in the CSV file.

Directory URI Provisioning

In Cisco Unified CM Administration, you can assign directory URIs in the local cluster in the following ways:

- End User Configuration—In End User Configuration, you can create end users and assign a phone, primary extension, and directory URI to that end user. Alternatively, if you synchronize your corporate LDAP directory with Cisco Unified Communications Manager, the LDAP data automatically populates for your end users. If the users in your LDAP directory have a phone, primary extension, and directory URI, they will automatically have directory URIs in Cisco Unified Communications Manager End User Configuration after the LDAP synchronization.

- Directory Number Configuration—In Directory Number Configuration, you can configure a directory number and associate a directory URI to that directory number. If that directory number is assigned to a phone, Cisco Unified Communications Manager allows you to dial that phone using the directory URI.

For both end user configuration and directory number configuration, you can also use Bulk Administration to import end users, directory URIs, directory numbers, and phones into Cisco Unified Communications Manager by bulk. See the Cisco Unified Communications Manager Bulk Administration Guide for more information.

For intracluster URI dialing, you must assign your directory URIs to a partition and calling search space. See Set Up URI Dialing, on page 1 for more information.

For intercluster URI dialing, Cisco Unified Communications Manager uses the Intercluster Lookup Service (ILS) to replicate directory URIs to other clusters in the ILS network. If ILS is configured to support intercluster directory URI Replication, each cluster sends out its catalog of known directory URIs to the other clusters in the ILS network. See Directory URI Replication with ILS, on page 5 for more information.

Directory URI and Directory Number Dial String Interpretation

Each phone that registers with Cisco Unified Communications Manager registers to its directory number. If a directory URI is associated with that directory number, users can dial that phone using the directory number
or the directory URI—either will reach the same destination. However, because directory numbers and directory URIs are saved in different lookup tables in the database, Cisco Unified Communications Manager must be able to determine which dialing format is used, or it will not be able to route the call.

The Dial String Interpretation field that appears in the SIP Profile Configuration window allows you to set the rules that Cisco Unified Communications Manager uses to examine the user portion of a dial string and determine whether to route the call as a directory URI or a directory number. Because directory URLs can use both alpha and numeric characters, many dial strings are arbitrary and could be configured as either a directory URI or directory number. For example, you can configure Cisco Unified Communications Manager to route a dial string of `1234ABCD@10.10.10.1` as a directory number or as a directory URI. To ensure that calls are not dropped, you must configure a consistent policy for your network.

For more information on the Dial String Interpretation field, see topics related to SIP profile settings in the *Cisco Unified Communications Manager Administration Guide*.

**Directory URI Call Routing**

Cisco Unified Communications Manager uses the following logic to route calls that are placed to a directory URI:

- Cisco Unified Communications Manager checks if the dial string is numeric according to the Dial String Interpretation policy. If the dial string is numeric, Cisco Unified Communications Manager routes the call as a directory number.

- Else, Cisco Unified Communications Manager checks local calling search spaces and the local directory URI lookup table to see if the directory URI is in the local cluster. If the directory URI is on cluster, Cisco Unified Communications Manager routes the call to the appropriate endpoint.

- Else, Cisco Unified Communications Manager checks if the directory URI exists in a learned or imported catalog. If the directory URI is in a URI catalog, Cisco Unified Communications Manager tries to match the route string for the catalog to a SIP route pattern. If a matching SIP route pattern is found, Cisco Unified Communications Manager routes the call to the trunk that is associated with that route pattern.

- Else, Cisco Unified Communications Manager tries to match the host portion of the directory URI to a SIP route pattern. If the host portion matches a SIP route pattern, Cisco Unified Communications Manager routes the call to the SIP trunk that is associated to that route pattern.

- Else, Cisco Unified Communications Manager blocks the call.

**Directory URI Replication with ILS**

Cisco Unified Communications Manager uses the Intercluster Lookup Service (ILS) to support intercluster URI dialing. Using ILS, you can create large networks of remote Cisco Unified Communications Manager clusters. ILS also contains an optional directory URI replication feature that allows the clusters in an ILS network to replicate their directory URIs to the other clusters in the ILS network.

Directory URI Replication is configured individually for each cluster. Be aware that if you leave the feature disabled on a single cluster, it can affect other clusters in the network. For example, if directory URI replication is configured across the ILS network but is left disabled on a single hub cluster, the spoke clusters that are connected to that hub cannot exchange directory URIs with the rest of the ILS network.
To enable URI Replication in a cluster, check the Exchange Directory URIs with Remote Clusters check box that appears in Intercluster Directory URI Configuration. When this check box is checked, each cluster sends the following to the other clusters in the ILS network:

- All directory URIs known by the local cluster.
- The local route string for each set of directory URIs.

**Directory URI Catalog Types**

Within an individual cluster, directory URIs can be categorized as follows:

- Local directory URIs—Directory URIs that are configured on the local system and which are saved in the local Unified CM database.
- Remote directory URIs—Directory URIs that were configured in another cluster and then replicated to this cluster.
- Imported Directory URI catalogs—Third party directory URIs that were manually imported into this cluster.
- Remote Imported Directory URI catalogs—Third party directory URIs that were manually imported into another cluster in the ILS network and then replicated to this cluster with ILS.

Local directory URIs are saved in the local Unified CM database. All other directory URIs are saved in CSV files that are maintained by ILS. When directory URI replication is enabled, ILS exchanges all types of directory URIs to the other clusters in the ILS network.

**Route Strings**

In order to implement intercluster URI dialing, each cluster in the ILS network must be configured with a route string and SIP route patterns that match the route strings to an outbound trunk.

In many cases, the host portion of the directory URI is not granular enough for Unified CM to locate the cluster with the phone that is associated to that directory URI. Route strings provide additional information that Unified CM can use to route a call. When URI Replication is enabled, Unified CM exchanges directory URIs and the route string for the local cluster where that directory URI is saved.

You can create whatever route strings you want. For example, if you are joining clusters in San Jose and Paris, you could assign SanJose.USA.NorthAmerica and Paris.France.Europe as route strings for the two clusters.

After you assign route strings for the various clusters, you must configure SIP route patterns that match the route strings for the next hop clusters in your ILS network. For example, in the San Jose cluster, you could configure a SIP route pattern that routes calls with a route string of Paris.France.Europe to an outbound SIP trunk.

If the San Jose cluster receives a call that is addressed to a directory URI from the Paris cluster, Unified CM checks the list of directory URIs maintained by ILS and pulls the directory URI and its local route string of Paris.France.Europe. If a SIP route pattern is configured that routes calls for Paris.France.Europe, Unified CM sends the call to the outbound trunk for that route pattern.

For more detail on configuring route strings, refer to the Cisco Unified Communications System SRND.
Directory URI Interoperability with VCS or Third Party System

Cisco Unified Communications Manager gives users with a supported endpoint the ability to place calls to alphanumeric URIs such as johnsmith@acme.com. The simplest way to route directory URI calls from a supported endpoint on Cisco Unified Communications Manager to an endpoint on a Cisco TelePresence Video Communications Server (VCS) or a third party call control system is to configure a domain-based SIP route pattern. For example, you can configure a SIP route pattern of acme.com to route calls addressed to the acme.com domain out a SIP trunk that is configured for the Cisco TelePresence VCS or a third party call control system.

In situations where you have more than one Cisco TelePresence VCS or third party call control systems that use the same domain name, Cisco Unified Communications Manager can use the Intercluster Lookup Service (ILS) to provide URI dialing interoperability. For each Cisco TelePresence VCS, or third party system, you must manually create a csv file with the directory URIs that are registered to that call control system.

On a Cisco Unified Communications Manager cluster that is set up as a hub cluster in an ILS network, you can create an Imported directory URI catalog for each Cisco TelePresence VCS, or third party system, and assign a unique route string for each catalog. After you import the csv files into their corresponding Imported directory URI catalog, ILS replicates the imported directory URI catalog and route string to the other clusters in the ILS network.

On each Cisco Unified Communications Manager cluster, configure SIP Route Patterns that match the route string assigned to each Imported directory URI catalog in order to allow Cisco Unified Communications Manager to route directory URIs to an outbound trunk that is destined for the Cisco TelePresence VCS or third party system.

For more information on how to import directory URIs from a VCS into Cisco Unified Communications Manager, see the "Import directory URIs from a non-ILS system" procedure in the Intercluster Directory URI chapter of the Cisco Unified Communications Manager Administration Guide.

Cisco Unified Communications Manager also provides directory URI export functionality. You can export all directory URIs that were configured in the local cluster, including those that were imported from an LDAP directory, to a csv file that you can import into the other call control system. For more information on how to export directory URIs from Cisco Unified Communications Manager to a csv file, see the "Intercluster directory URI settings" section in the Intercluster Directory URI chapter of the Cisco Unified Communications Manager Administration Guide.

Directory URI LDAP Integration

Cisco Unified Communications Manager supports synchronization of directory URI fields in Cisco Unified CM Administration with data from a corporate LDAP directory.

When you synchronize with an LDAP directory, Cisco Unified Communications Manager automatically assigns the directory URI value that you choose from the LDAP directory as the primary directory URI for that end user. Even if you have already configured a directory URI as the primary directory URI for that end user’s primary extension, the LDAP value overrides the value that is configured in Cisco Unified CM Administration.
The user portion of a directory URI is case-sensitive. As a result, whatever case the directory URI has in the LDAP directory is the case in Cisco Unified Communications Manager. For example, if the directory URI value in LDAP is JOE@cisco.com, calls to joe@cisco.com in Cisco Unified Communications Manager will fail.

For compatibility with third party call control systems, Cisco recommends using lower case for directory URIs.

For Cisco Unified Communications Manager systems where LDAP synchronization was configured prior to Release 9.0, the directory URI field is not automatically enabled for synchronization. You must create a new LDAP synchronization agreement.

Directory URI and Directory Number Blended Address

Cisco Unified Communications Manager supports blended addressing of directory URIs and directory numbers. When blended addressing is enabled across the network, Cisco Unified Communications Manager inserts both the directory URI and the directory number of the sending party in outgoing SIP Invites, or responses to SIP Invites. The destination endpoint has the option of using either the directory URI or the directory number for its response—both will reach the same destination.

Cisco Unified Communications Manager uses the x-cisco-number tag in the SIP identity headers to communicate a blended address. When both a directory URI and directory number are available for the sending phone and blended addressing is enabled, Cisco Unified Communications Manager uses the directory URI in the From fields of the SIP message and adds the x-cisco-number tag with the accompanying directory number to the SIP identity headers. The x-cisco-number tag identifies the directory number that is associated with the directory URI.

For Cisco Unified Communications Manager to deliver a SIP message with blended addressing, the following conditions must be true:

- For all SIP trunks between the phones, the Calling and Connected Party Info Format drop-down list box must be set to Deliver URI and DN in connected party.
- Both a directory URI and a directory number must be configured for the phone that is sending the SIP message.
- The destination endpoint must support blended addressing.

For SIP trunks, blended addressing is enabled in the Trunk Configuration window of Cisco Unified CM Administration by setting the Calling and Connected Party Info Format drop-down list box to Deliver URI and DN in connected party. When Cisco Unified Communications Manager receives a SIP message with a blended address that is to be forwarded out a trunk, Cisco Unified Communications Manager checks whether blended addressing is enabled on the trunk before forwarding the message. If blended addressing is not enabled on the trunk, Cisco Unified Communications Manager removes the x-cisco-number tag before forwarding the SIP message.
For SIP lines, blended addressing is enabled by default. However, if a SIP message with a blended address is being forwarded out a SIP line to the destination endpoint, Cisco Unified Communications Manager checks whether the endpoint supports blended addressing. If the destination endpoint does not support blended addressing, Cisco Unified Communications Manager removes the x-cisco-number tag before forwarding the SIP message to the endpoint.

Blended addressing can be applied to the RPID, PAI, PPI, and Diversion headers.

Example 1
Bob at Cisco makes a call from extension 2100. The Calling and Connected Party Info Format field in the Trunk Configuration window is set to **Deliver DN only in connected party**. Blended addressing is not applied and the x-cisco-number tag is not added to the outgoing SIP message.

From: <sip:2100@10.10.10.1>
Remote-Party-ID: <sip:2100@10.10.10.1>;party=calling

Example 2
Jill at Cisco makes a call from extension 2030. The Calling and Connected Party Info Format field in the Trunk Configuration window is set to **Deliver URI only in connected party**. Blended addressing is not applied and the x-cisco-number tag is not added to the outgoing SIP message.

From: <sip:jill@cisco.com>
Remote-Party-ID: <sip:jill@cisco.com>;party=calling

Example 3
Alice at Cisco makes a call from extension 2000. The Calling and Connected Party Info Format field in the Trunk Configuration window is set to **Deliver DN and URI in connected party**. Blended addressing is applied. Cisco Unified Communications Manager adds the x-cisco-number tag to the SIP identity header.

From: <sip:alice@cisco.com>
Remote-Party-ID: <sip:alice@cisco.com>x-cisco-number=2000>;party=calling

John at Cisco extension 4003 receives Alice’s call, but John has his office phone set to forward calls to his home phone. If blended addressing is enabled, Cisco Unified Communications Manager adds a Diversion header with the x-cisco-number tag, and forwards the SIP INVITE to John’s home phone.

From: <sip:alice@cisco.com>
Diversion: <sip:john@cisco.com>x-cisco.number=4003>reason=no-answer
Remote-Party-ID: <sip:alice@cisco.com>x-cisco-number=2000>;party=calling

Set Up Digit Transformations for URI Dialing

If your network applies digit transformation patterns to calling party directory numbers and you are implementing URI dialing across clusters, you can apply calling party transformation patterns against the Inbound Call Settings of the phone or device pool. This is required because Cisco Unified Communications Manager cannot perform calling party transformations if the calling party transformation is applied based on the called party directory number or pattern.

For intercluster calls, you can apply a digit transformation pattern against a Calling Search Space (CSS) and apply that CSS transformation to the Inbound Call Settings for the phone or device pool. Before routing the call, whether the dialed number is a directory URI or a directory number, Cisco Unified Communications Manager applies the transformation pattern to the calling directory number.

For intracluster calls, if you don’t want the calling party transformation to be applied for calls that remain in the local cluster, you can also apply a CSS transformation pattern that strips the digits that were added by the Inbound Call Settings and apply that pattern to the Outbound Call Settings for the phone or device pool. For
the device pool, the Calling Party Transformation CSS for outbound calls appears under Device Mobility Related Information.

To apply calling party digit transformations when URI dialing is implemented, do the following:

Procedure

**Step 1** In Cisco Unified CM Administration, choose **Call Routing > Class of Control > Partition** and create a new partition (for example, Change Calling Party XXXX to 8XXXXXXX).

**Step 2** Choose **Call Routing > Class of Control > Calling Search Space** and do the following:
- Create a calling search space (for example, Change Calling Party XXX to 8XXXXXXX).
- In the Available Partitions list box, add the newly created partition (for example, Change Calling Party XXXX to 8XXXXXXX).

**Step 3** In Cisco Unified CM Administration, choose **Call Routing > Transformation > Transformation Pattern > Calling Party Transformation Pattern**.
- Create a transformation pattern (for example, XXXX)
- Set the partition to the partition that you created in the previous steps (for example Change Calling Party XXXX to 8XXXXXXX).
- Set the Calling Party Transformation Mask to the desired mask (for example, 8265XXXX).

**Step 4** In Cisco Unified CM Administration, choose **Call Routing > Class of Control > Partition** and create a new partition (for example, Change Calling Party 8XXXXXXX to XXXX).

**Step 5** Choose **Call Routing > Class of Control > Calling Search Space** and do the following:
- Create a calling search space (for example, Change Calling Party 8XXXXXXX to XXX).
- In the Available Partitions list box, add the newly created partition (for example, Change Calling Party 8XXXXXXX to XXX).

**Step 6** In Cisco Unified CM Administration, choose **Call Routing > Transformation > Transformation Pattern > Calling Party Transformation Pattern**.
- Create a transformation pattern (for example, 8265XXXX)
- Set the partition to the partition that you created in the previous steps (for example, Change Calling Party 8XXXXXXX to XXXX).
- Set the Calling Party Transformation Mask to the desired mask (for example, XXXX).

**Step 7** To assign your transformation patterns to an individual phone, choose **Device > Phone** and apply the following settings to the phone:
- For patterns that apply to inbound settings, choose the CSS that contains the pattern from the Calling Party Transformation CSS drop-down list box that appears under Inbound Calls.
• For patterns that apply to outbound settings, choose the CSS that contains the pattern from the Calling Party Transformation CSS drop-down list box that appears under Outbound Calls.

Step 8  Click Save.

Note  You can also apply the digit transformation patterns to a device pool by choosing System > Device Pool from Cisco Unified CM Administration. For device pool configuration, the Calling Party Transformation CSS for outbound calls appears under Device Mobility Related Information.

Directory URI Troubleshooting Tips

This section describes some basic troubleshooting scenarios for URI dialing.

Directory URI Has Been Dialed, but the Call Fails

Check the following:

• The user portion of a directory URIs is case sensitive. Check that the dialed directory URI and the provisioned directory URI use the same case.

• Check the partition, directory URI partition, and calling search space of the called party. For intracluster calls, make sure the destination phone is in the same calling search space.

• Check the Dial String Interpretation policy against the dialed directory URI. If the implemented dial string interpretation policy interprets the directory URI as a directory number, Cisco Unified Communications Manager may not be able to route the call.

• Use the Dialed Number Analyzer tool to determine if Cisco Unified Communications Manager can route a call to that directory URI.

  Note  The Dialed Number Analyzer can only be used to test routing for intracluster calls.

Directory URI Has Been Dialed, but the Call Display Shows a Directory Number

Check the following:

• Check to see whether the phone model supports blended addressing. If the phone model does not support blended addressing, the directory number is displayed.

• Check to see whether the Alerting Name is configured. The Alerting Name overrides the dial string.

• If the incorrect display is on the called phone, check to see whether the calling phone has a primary directory URI configured.