



Intercluster Lookup Service

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The ILS cluster discovery service allows Cisco Unified Communications Manager to learn about remote clusters without the need for an administrator to manually configure connections between each cluster.

ILS supports the Global Dial Plan Replication feature. This feature allows you to quickly configure a global dial plan, including directory URIs, alternate numbers, number patterns, PSTN failover numbers, and route strings, that spans across the entire ILS network.

The ILS service runs only on the Unified Communications Manager publisher node.

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Set Up ILS Network

The following procedure describes the steps required to set up an ILS network.

Procedure

- Step 1** Study your network and design an ILS topology.
- Step 2** Assign unique cluster IDs for each cluster in your network.
- Step 3** If you want to use TLS authentication between clusters, you must exchange Tomcat certificates between the publisher node of each cluster in the ILS topology. From Cisco Unified Operating System Administration, use the Bulk Certificate Management feature to:
- For each cluster in your network, export certificates from the publisher node to a central location.
 - From any publisher node server in your ILS network, consolidate exported certificates.
 - For each cluster in your network, import certificates into the publisher node for that cluster.
- Step 4** If you want to use password authentication between remote clusters, assign a password for all communications between clusters in your ILS network.
- Step 5** Activate ILS on the first hub cluster in your ILS network by doing the following:
- Login to the Unified Communications Manager publisher node.
 - In Cisco Unified CM Administration, choose **Advanced Features > ILS Configuration**.
 - Change the Role to **Hub Cluster** and click **Save**.
 - In the ILS Configuration Registration popup window, leave the Registration Server text box empty and click **OK**.
- Step 6** Activate ILS on the remaining hub and spoke clusters in your ILS network. When prompted for a registration server, enter the IP address or fully qualified domain name of the publisher node for an existing hub cluster in your ILS network.
- Step 7** Confirm that your ILS network is configured by viewing the network in the ILS Clusters and Directory URI Imported Catalogs view in the ILS Configuration window. When the full network appears, your ILS network is configured for cluster discovery.
- Step 8** Optional. If you want ILS to support Global Dial Plan Replication, for each cluster in the ILS network, open the ILS Configuration window and do the following:
- Check the **Exchange Global Dial Plan Replication Data with Remote Clusters** check box.
 - In the Advertised Route String text box, assign a route string for this cluster.
 - Click **Save**.
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ILS Network Components

In Cisco Unified CM Administration, you can configure ILS on a pair of clusters and then join those clusters to form an ILS network. ILS allows you to join additional clusters to the network without having to configure the connections between each cluster.

An ILS network comprises the following components:

- Hub clusters
- Spoke clusters
- Global dial plan imported catalogs

You must configure each cluster in your ILS network as either a hub cluster or a spoke cluster. Each ILS network must have at least one hub cluster.

You can view the current structure and status of the ILS network from the ILS Clusters and Directory URI Imported Catalogs view in the ILS Configuration window of Cisco Unified CM Administration.

Hub Clusters

Each ILS network must have at least one hub cluster. Hub clusters form the backbone of an ILS network. Hub clusters exchange ILS updates with the other hub clusters in the ILS network, and then relay that information to and from their spoke clusters.

ILS uses automesh functionality to create a full mesh connection between all hub clusters within an ILS network. When a new hub cluster registers to another hub cluster in an existing ILS network, ILS automatically creates a full mesh connection between the new hub cluster and all the existing hub clusters in the ILS network.

You can connect a hub cluster to multiple other hub clusters, or you might configure a hub cluster as the only hub cluster in the network. In addition, you can connect a hub cluster to multiple spoke clusters, or you might configure the hub cluster with no spokes clusters.

Spoke Clusters

A spoke cluster in an ILS network relies on the hub cluster that it is connected to in order to relay ILS updates to and from the rest of the ILS network. Although a hub cluster can have many spokes, a spoke cluster can have only one hub cluster. Spoke clusters contact only their local hub cluster and never directly contact other hub clusters or other spoke clusters.

Global Dial Plan Imported Catalogs

You cannot connect a third party call control system into an ILS network. However, in order to provide URI dialing compatibility with third party systems, you can manually import a third party directory URI or +E.164 number catalog from a CSV file into any hub cluster in the ILS network. ILS maintains the imported catalog and replicates that catalog out to the other clusters in the network so that you can dial one of the third party directory URIs or +E.164 numbers from any server in the ILS network. The imported catalog appears as its own item in the ILS Clusters and Global Dial Plan Imported Catalogs view in the ILS Configuration window.

You can import a third party catalog into a hub cluster only. You cannot import a third party catalog into a spoke cluster.

Synchronization Updates

For cluster synchronization updates, ILS uses a pull-based model in which an ILS cluster sends out an update request to a remote cluster and the remote cluster responds with the requested information. The time interval between update requests depends on the synchronization interval that is configured in the ILS Configuration window in Cisco Unified CM Administration.

For detailed information on setting up an ILS network topology, see the Cisco Unified Communications System SRND.

ILS Network Capacities

ILS networking can scale up to 100 total clusters with at most 10 hubs and 10 spokes per hub. Hub and spoke combination topology is used to avoid too many TCP connections created within each cluster.

ILS Cluster Discovery

Cluster discovery is the base service that ILS provides. ILS cluster discovery allows Cisco Unified Communications Manager clusters to learn dynamically about remote clusters without the need for an administrator to manually configure connections between those clusters.

For example, if you have an existing ILS network of four Cisco Unified Communications Manager clusters and you want to add an additional cluster, you can configure ILS on the new cluster and then register that cluster to any hub cluster in the existing ILS network. ILS automatically informs the new cluster of all clusters in the existing network.

Each cluster in an ILS network exchanges update messages, called peer info vectors, that are designed to inform remote clusters of the status of each cluster in the network. The update messages contain information about the known clusters in the network, including:

- Cluster IDs
- Cluster descriptions and versions
- Fully qualified domain name of the host
- IP addresses and hostnames for the cluster nodes that have ILS activated

The ILS cluster discovery feature automatically populates the list of remote clusters that can be viewed in Cisco Unified CM Administration by choosing **Advanced Features > Cluster View**. From this window, you can configure services such as Extension Mobility Cross Cluster, TFTP, and RSVP Agent for remote clusters.

If Global Dial Plan Replication is also enabled in the network, ILS sends separate messages containing global dial plan data.

Global Dial Plan Replication with ILS

Cisco Unified Communications Manager uses the Intercluster Lookup Service (ILS) to support the Global Dial Plan Replication feature. When Global Dial Plan Replication is enabled across an ILS network, remote clusters in an ILS network share global dial plan data, including the following:

- Directory URIs
- Alternate numbers
- Alternate number patterns
- Route strings
- PSTN failover numbers

Global Dial Plan Replication allows you to create a global dial plan including intercluster dialing of directory URIs and alternate numbers that spans across an ILS network. Global Dial Plan Replication allows you to quickly configure the global dial plan across the ILS network without the need to configure each dial plan component on each cluster separately. After you enable Global Dial Plan Replication across the network, you can simply configure the dial plan component on one cluster, and ILS replicates that information throughout the ILS network.

For detailed information on how to set up Global Dial Plan Replication, see the “Global Dial Plan Replication” chapter.

Related Topics

[Global Dial Plan Replication](#)

ILS Configuration Settings

In Cisco Unified Communications Manager Administration, use the **Advanced Features > ILS Configuration** menu path to configure the Intercluster Lookup Service (ILS) on Cisco Unified Communications Manager clusters.

Although ILS is activated and runs on the publisher node, the configuration settings are applied on a cluster-wide basis. After ILS is configured on the publisher node, those settings are propagated out to the other cluster nodes.

The following table describes the ILS Configuration field settings.

Table 1: ILS Configuration Settings

Field	Description
Role	<p>From the drop-down list box, choose the ILS role for this cluster from the following options:</p> <ul style="list-style-type: none"> • Stand Alone Cluster—Stand alone clusters cannot join an ILS network. This is the default option. • Hub Cluster—Hub clusters act as hubs within the ILS network. Hub clusters may connect to multiple hub and spoke clusters. Hub clusters exchange ILS updates with other hub clusters and then communicate that information to their spoke clusters. <p>If the cluster that you are configuring is a hub cluster, and you want to connect this hub cluster to a remote hub cluster, you can enter a registration server for the remote hub cluster in the ILS Cluster Registration popup window that appears after you click Save.</p> <p>If you want to connect this hub cluster to another hub cluster, click the Register to another hub button and enter the IP address or fully qualified domain name of the publisher node for the hub cluster to which you want to connect. This button does not appear if the local cluster is enabled as a stand alone cluster or as a spoke cluster.</p> <ul style="list-style-type: none"> • Spoke Cluster—Spoke clusters register to a single hub cluster. Spoke clusters rely on the hub in order to communicate with remote clusters. If you choose a spoke cluster, you must enter a registration server in the text box that appears after you click the Save button

Field	Description
Exchange Global Dial Plan Replication Data with Remote Clusters	<p>Check this check box to enable Global Dial Plan Replication for this cluster. When Global Dial Plan Replication is enabled, the local cluster advertises its catalog of local and learned directory URIs, alternate numbers, alternate number patterns, PSTN failover numbers, and route strings, to remote clusters in the ILS network. In addition, the local cluster also receives the same types of replication data from the remote clusters in the ILS network.</p> <p>Note You must check this check box if you want to implement intercluster URI dialing.</p> <p>Note Even if Global Dial Plan Replication is enabled, you can include or exclude an individual directory URI or alternate number from being replicated. If the Advertise Globally via ILS check box in Directory Number Configuration window is not checked for an individual directory URI or alternate number, Cisco Unified Communications Manager does not include that directory URI or alternate number with the Global Dial Plan Replication data.</p>
Advertised Route String	<p>In the text box, enter a route string. Route strings can be up to 64 alphanumeric characters and can include dots(.) and dashes(-).</p> <p>If Global Dial Plan Replication is enabled, ILS associates this route string to all the global dial plan replication data that was configured in this cluster and advertises the route string and global dial plan data to the rest of the ILS network. Global dial plan data includes all the directory URIs, alternate numbers, and alternate number patterns that were configured in this cluster.</p> <p>When a user in a remote cluster dials a number that matches a directory URI, alternate number, or alternate number pattern from this cluster, Cisco Unified Communications Manager matches the called number to this route string, looks for a SIP route pattern that matches the route string, and routes the call to the outbound trunk specified by the SIP route pattern.</p>
Synchronize Clusters Every	Enter the delay, in minutes, between when the local cluster checks with remote clusters for ILS updates. The default value is 10 minutes.
ILS Authentication	
Use TLS Certificates	Click this radio button to configure ILS to use TLS to encrypt communications between remote clusters. If you check this radio button, and you are using certificates that are not signed by a trusted certificate authority, you must exchange Tomcat certificates between the clusters in your network.
Use Password	Click this radio button to configure ILS to use password based authentication for communications between remote clusters. If you check this radio button, you must enter a password. You must configure all clusters in your network with the same password.
Confirm Password	If you checked Use Password, confirm your password here.

Field	Description
Registration Server	<p>The Registration Server text box appears in the ILS Cluster Registration popup window that displays after you change the Role to Spoke Cluster or Hub Cluster and click Save.</p> <p>To enter a registration server, enter the IP address or fully qualified domain name of the publisher node in the hub cluster to which you want to connect. You must enter a registration server in the following circumstances:</p> <ul style="list-style-type: none"> • If you are configuring a spoke cluster, you must enter a registration server for the hub cluster to which you want to connect. • If you are configuring a hub cluster, you only have to enter a registration server if you want to connect this hub cluster to another hub cluster in the ILS network. Otherwise, you can leave the field blank. <p>If ILS is running on both the local and remote clusters, ILS uses the registration server to form a relationship with the remote cluster. Once ILS forms a connection, the registration server is no longer used.</p>
Activate the Intercluster Lookup Service on the publisher in this cluster	<p>This check box appears in the ILS Cluster Registration popup window that displays after you change the Role to Spoke Cluster or Hub Cluster and click Save. Check this check box if you want to activate ILS on the publisher node in the cluster.</p>
ILS Clusters and Imported Directory URI Catalogs	

Field	Description
<p>ILS Clusters and Imported Directory URI Catalogs</p>	<p>This section displays a snapshot of the current ILS network, including all hub clusters, spoke clusters, and imported directory URI catalogs. Spoke clusters are displayed under their associated hub cluster. The cluster that you are currently logged into is identified as the local cluster</p> <p>For large networks, you can use the Find button to filter the display to just those clusters that meet specific search criteria.</p> <p>The table contains the following columns:</p> <ul style="list-style-type: none"> • Cluster ID/Name—This column displays the cluster ID for the remote cluster. If the other cluster is from a non-ILS system that was manually imported into Cisco Unified CM, the field displays the imported catalog name and the Role column lists the catalog as a Directory URI Imported Catalog. • Last Contact Time—This column displays the last time the local cluster had direct contact with this cluster. If more than two replication intervals pass without an update from the other cluster, a warning icon appears, alerting you that there may be a connection issue. <p>Note Spoke clusters only make direct contact with their local hub cluster. Spoke clusters never contact remote hub clusters, or other spokes.</p> <ul style="list-style-type: none"> • Role—This column displays whether the remote cluster is a hub cluster, spoke cluster, or an imported directory URI catalog. The cluster that you are currently logged into is identified as the local cluster. • Advertised Route String—This column displays the route string for the remote cluster or imported directory URI catalog. • Last USN Data Received—This column displays the last time the local cluster received an updated USN data from this cluster or imported catalog. • USN Data Synchronization Status—This column displays the USN replication status of the cluster or imported directory URI catalog. • Action—Click Disconnect if you want to remove this cluster from the ILS network. <p>Note If you disconnect a hub cluster from the network, Cisco Unified Communications Manager also disconnects that hub cluster’s spoke clusters.</p>

ILS Troubleshooting

Local Cluster Cannot Connect to the ILS Network

To troubleshoot connection issues within the local cluster, open RTMT and run alarms and diagnostic traces on that publisher node.

If you receive an error message when trying to establish ILS between your clusters, you can try to restart the Cisco Intercluster Lookup service from Cisco Unified Serviceability Administration.

In addition, connection issues may arise if authentication is improperly configured between clusters. Check authentication in the following manner:

- If you are using TLS, make sure that all clusters in the network are using TLS and that Tomcat certificates have been exchanged for all the servers that need to communicate.



Note Certificates exchanged using bulk certificate export, merge, and import can cause an untrusted ILS hub due to TLS errors.

- If you are using TCP password authentication, make sure that all ILS clusters are using TCP password authentication and that the same TCP password is assigned across the network.

Directory URIs Are Not Being Replicated Across the ILS Network

This error can occur for a variety of reasons. Check the following:

- Verify that all clusters in the network are configured to exchange global dial plan data. If a hub cluster is not configured to exchange global dial plan data, none of that hub's spoke clusters will be able to exchange directory URI catalogs.
- Allow enough time for end-to-end replication based on synchronization intervals (set on the ILS Configuration page) that are configured for all the clusters involved in the path. All clusters in an ILS network are a maximum of three hops from every other cluster in the network.
- Use the **utils ils showpeerinfo** CLI command to monitor replication progress by looking at the USN values for the remote clusters.
- Increase speed of replication by changing the ILS Sync Throttle Service Parameter. Note that a low setting can affect system performance.
- Verify that all clusters in the ILS network have unique cluster IDs and that none of the clusters are configured with Stand Alone Cluster as its cluster ID. You can check Cluster IDs in Cisco Unified CM Administration under **System > Enterprise Parameters**.

Global Dial Plan Replication Is Configured, but Unified CM Still Cannot Place a Call to A Learned Directory URI or Learned Number in a Remote ILS Cluster

This condition can occur if ILS and Global Dial Plan Replication are enabled on all clusters in the network, but SIP route patterns that route to the route strings for the remote clusters have not been configured. Do the following:

- In the ILS Clusters and Global Dial Plan Imported Catalogs view in the ILS Configuration window, check the route string for the remote cluster.
- In the SIP Route Pattern configuration window, make sure that you have route patterns that map to the route strings for your remote clusters.



Note When advertising URI patterns (`user@domain`), in the **SIP Profile Configuration** window, make sure that the **Dial String Interpretation** field is set to **Always treat all dial strings as URI addresses** to prevent the devices to dial URI learned patterns with only numbers in the user section as Directory Number patterns. Alternatively, you can advertise only URI patterns with text strings in the user section through ILS.

ILS Global Dial Plan Replication Update is Cached Until Cisco Unified Communications Manager Database Replication is Not Corrected

The value of **Last USN Data Received** is Current and USN Data Synchronization Status is **Up to date**. However, the Learned URIs or Learned Patterns are not viewable on local cluster.

This condition occurs when database replication is not corrected. ILS caches the updates with learned URIs or patterns from remote clusters if database replication is not viewable on local cluster across all nodes. Unified Communications Manager can place a call to these learned URIs or patterns after the database replication is corrected.