Understanding Directory Numbers

Using the Directory Number Configuration window in Cisco CallManager Administration, you can configure and modify directory numbers (lines) that are assigned to phones. Keep in mind, however, that directory numbers (DNs) do not always associate with devices (see the "Managing Directory Numbers" section on page 18-5).

This section covers the following topics:

Characteristics of Directory Numbers

You can configure up to 200 calls for a line on a device in a cluster, with the limiting factor being the device. As you configure the number of calls for one line, the calls that are available for another line decrease. Cisco IP Phones that support the multicall display (such as a Cisco IP Phone model 7960) support up to 200 calls per DN and 2 calls per DN for non-multicall display devices (such as Cisco IP Phone model 7905).

The Cisco IP Phone displays the following information about each line:

- Unique call identifier (from 1 to 200). This identifier remains consistent across all multicall display devices that have a shared-line appearance.
- Call select status, an icon that shows the state of the currently selected call
- Call information such as calling party or called party
- Call state icon such as connected or hold
- Duration of a call

For configuration information, refer to the "Configuring a Directory Number" section in the *Cisco CallManager Administration Guide*.

User/Phone Add and Directory Numbers

The End User, Phone, DN, and LA Configuration window allows all-at-once addition of a new end user and a new phone that is associated with the new end user. You can associate a directory number (existing or new) and line appearance for the new end user by using the same window. To access the End User, Phone, DN, and LA Configuration window, choose the **User Management > User/Phone Add** menu option. See "User/Phone Add Configuration" in the *Cisco CallManager Administration Guide* for configuration details.

Note   The End User, Phone, DN, and LA Configuration window only allows addition of a new end user and a new phone. The window does not allow entry of existing end users or existing phones.

Shared Line Appearance

You can set up one or more lines with a shared-line appearance. A Cisco CallManager system considers a directory number to be a shared line if it appears on more than one device in the same partition. For example, if directory number 9600 on phone A is in the partition called Dallas and on phone B in the partition called Texas, that directory number does not represent a shared-line appearance. (Ensure the directory number 9600 for phone A and phone B are in the same partition; for example, Dallas.)

In a shared-line appearance, for example, you can set up a shared line, so a directory number appears on line 1 of a manager phone and also on line 2 of an assistant phone. Another example of a shared line involves a single incoming 800 number that is set up to appear as line 2 on every sales representative phone in an office. You can also choose to update a directory number and have the updates apply to all devices that share the directory number.

The following information provides tips about and lists the restrictions for using shared-line appearances with Cisco CallManager.

Shared Line Tips

Use the following tips when configuring shared lines:

- You create a shared-line appearance by assigning the same directory number and route partition to different devices.

- If multiple devices share a line, each device name displays in the Associated Devices pane of the directory number in the Directory Number Configuration window in Cisco CallManager Administration.

- If you change the Calling Search Space or Call Forward and Pickup settings on any device that uses the shared line, the changes apply to all devices that use that shared line.

- To stop sharing a line appearance on a device, change the directory number or partition name for the line and update the directory number in the Directory Number Configuration window in Cisco CallManager Administration.

- In the case of a shared-line appearance, Remove From Device removes the directory number on the current device only and does not affect other devices.

- Most devices with a shared-line appearance can make or receive new calls or resume held calls at the same time. Incoming calls display on all devices that share a line, and anyone can answer the call. Only one call remains active at a time on a device. For limitations, see the "Shared Line Restrictions" section on page 18-4.

> **Note**   Cisco SIP IP Phones models 7905, 7912, 7940, and 7960 will not display remote-in-use calls and cannot do remote resume (cannot pick up a held line that is shared). These Cisco SIP phones do not support shared-line features such as Barge, cBarge, and Privacy.

- Call information (such as calling party or called party) displays on all devices that are sharing a line. If one of the devices turns on the Privacy feature, other devices that share the line will not see outbound calls that are made from the device that turned on privacy. All devices will still see inbound calls to the shared line.

- Devices with shared-line appearances can initiate independent transfer transactions.

- Devices with shared-line appearances can initiate independent conference transactions.

- Devices with shared-line appearance support the Call Forward Busy Trigger and the Maximum Number of Calls settings. You can configure Call Forward Busy Trigger per line appearance, but the configuration cannot exceed the maximum number call setting for that directory number.

  The following example demonstrates how three Cisco IP Phones with the same shared-line appearance, directory number 2000, use Call Forward Busy Trigger and Maximum Number of Calls settings. This example assumes that two calls occur. The following values configuration applies for the devices:

  - Cisco IP Phone 1—Configured for a maximum call value of 1 and busy trigger value of 1
  - Cisco IP Phone 2—Configured for a maximum call value of 1 and busy trigger value of 1
  - Cisco IP Phone 3—Configured a for maximum call value of 2 and busy trigger value of 2

  When User 1 dials directory number 2000 for the first call, all three devices ring. The user for the Cisco IP Phone 3 picks up the call, and the Cisco IP Phones 1 and 2 go to remote in use. When the user for Cisco IP Phone 3 puts the call on hold, user can retrieve the call from the Cisco IP Phone 1 or Cisco IP Phone 2. When User 2 dials directory number 2000 for the second call, only Cisco IP Phone 2 and Cisco IP Phone 3 ring.

  The following example demonstrates how an H.323 client, MGCP POTS phone, and Cisco IP Phone with the same shared line appearance, directory number 2000, can use the Call Forward Busy Trigger and the Maximum Number of Calls settings. This example assumes that two calls occur. The following values configuration applies for the devices:

  - H.323 client—Configured for a maximum call value of 1 and busy trigger value of 1
  - MGCP POTS Phone—Configured for a maximum call value of 1 and busy trigger value of 1
  - Cisco IP Phone—Configured for a maximum call value of 2 and busy trigger value of 2

  When User 1 dials directory number 2000 for the first call, all three devices ring. The user for the Cisco IP Phone picks up the call; when the user for Cisco IP Phone puts the call on hold, the user(s) for H323 client and MGCP POTS phone cannot retrieve the call. If User 2 dials directory number 2000 for the second call, all three devices (IP phone, MCGP POTS phone, H.323 client) ring, and all three users can answer the call.

  For information on Maximum Number of Calls setting, refer to the "Directory Number Configuration Settings" section in the *Cisco CallManager Administration Guide*.

The check box, Update Directory Number of All Devices Sharing this Line, in the Directory Number Configuration window, determines whether a shared directory number gets updated to all devices that share the number. See the "Update Directory Number of All Devices Sharing This Line" section on page 18-5 for more information.

A shared-line phone should not be able to interact with the call that it rejects, due to the limitation of the maximum number of calls per DN or for other reasons. For example, A and A[1] share the same DN. A[1] and A have the maximum number of calls set to 1 and 2, respectively. When C and D call the share line DN, A[1] answers these two calls. A can only interact with the first call, as it rejects the second call due to its own maximum number of calls per DN limitation. For this reason, Cisco recommends that the same value be configured for the maximum number of calls for all shared-line MCID devices. For N number of devices that share the same line, ensure both Maximum Calls setting and Busy Trigger setting are set to N. This allows each shared-line user to receive at least one call.

The shared-line phone should not interact with the call that it does not receive (because the Line Control does not maintain call information). So, a newly registered device will not recognize any existing calls on that line. The newly registered device cannot resume any held call if the call started before this device was registered with the Line Control. For example, A and A[1] share the same line, A is powered down (or logged out for the extension mobility user), and A's receives an active call. After phone A is on and it registers with Cisco CallManager, A should not see the existing active call in this line.

If shared-line phones' calls should interact with each other, Cisco recommends that you set the maximum number of calls for all shared-lines MCID devices to 2*N, where N specifies the number of shared-line devices.

Shared Line Restrictions

The following restrictions apply to shared lines:

- Do not use shared lines for Cisco CallManager Attendant Console pilot points or hunt group members. The phone that acts as the attendant console supports shared lines.

- Do not use shared-line appearances on any Cisco IP Phone that requires autoanswer capability and do not turn on auto answer for a shared-line appearance.

- Do not configure shared-line appearances on the primary lines of the phones; for example, if two phones have a shared-line appearance, only one of the phones should have the primary line configured as shared (the other phone should have the secondary line configured as shared).

- Barge and Privacy work with shared lines only.

- Cisco recommends that you do not configure shared lines for Cisco IP Phones, H.323 clients, and MGCP POTS phones; likewise, Cisco recommends that you do not configure shared lines for H.323 clients and MGCP POTS phones. If you configure the same shared-line appearance for a H.323 client, a MGCP POTS phone, for example, NetMeeting, and a Cisco IP Phone, you cannot use the hold/resume feature on the H.323 client or MGCP POTS phone.

- Cisco recommends that you do not configure shared lines for Cisco SIP IP Phone models 7905, 7912, 7940, and 7960 because these phones cannot pick up held calls on shared lines nor can they use the shared-line features Barge, cBarge, and Privacy.

Managing Directory Numbers

Directory numbers associate with devices such as phones, route points, CTI ports, and H.323 clients. Administrators manage directory numbers from the Directory Number Configuration and Route Plan Report windows in Cisco CallManager Administration. Use the Directory Number Configuration window or the Phone Configuration window to add, update, and remove directory numbers from a device, route point, or port. Use the Route Plan Report window to delete or update unassigned directory numbers from Cisco CallManager database.

Note   Do not associate a directory number with a CTI route point or CTI port if the directory number is a member of a line group.

The Directory Number Configuration window contains two check boxes: Active and Update Directory Number of All Device Sharing this Line.

Active Check Box

The Active check box, which only displays for unassigned directory numbers, determines whether the directory number gets loaded and used by Cisco CallManager. By checking the check box, the directory number gets loaded and used by Cisco CallManager. For example, the directory number belonged to an employee who left the company. The directory number had certain settings that were configured, such as call forwarding to voice messaging. By leaving the directory number active, a call that is intended for the directory number will get forwarded. This eliminates the need to reconfigure another employee to have the same call-forwarding options. If the check box is not checked, the directory number will not get loaded by Cisco CallManager, which results in settings that are configured for that DN to not be used (for example, call forward destinations), and callers will not get their call forwarded properly.

Update Directory Number of All Devices Sharing This Line

This check box determines whether a shared directory number gets updated to all devices that share the number. When the check box is checked, all devices that share the directory number will receive the directory number change. If the check box remains unchecked, only the current device that is displayed in the window gets the directory number changed, and all other devices that share the directory number remain unchanged.

Note   This check box only applies to the actual directory number and partition. It does not apply to the other device settings such as voice-messaging profile, call forwarding options, or MLPP. If any of these settings are changed for a shared line, all devices get changed.

For directory number configuration and update information, refer to the "Directory Number Configuration Overview" section in the *Cisco CallManager Administration Guide*. For information about deleting and updating unassigned directory numbers, refer to "Deleting Unassigned Directory Numbers" and "Updating Unassigned Directory Numbers" in the *Cisco CallManager Administration Guide*.

Directory Number Features

Cisco CallManager enables you to configure the following features for directory numbers: call waiting and call forward.

For information about features that relate to phones, see the "Phone Features" section on page 43-20. The following features get configured for phones: barge, privacy release, call back, call park, call pickup, immediate divert, malicious call identification, quality report tool, service URL, and speed dial and abbreviated dial

Call Forward

Call forward allows a user to configure a Cisco IP Phone, so all calls that are destined for it ring another phone. The following types of call forward exist:

- Call forward all—Forwards all calls.
- Call forward busy—Forwards calls only when the line is in use and busy trigger setting is reached.
- Call forward no answer—Forwards calls when the phone is not answered after the configured no answer ring duration.
- Call forward no coverage—Forward calls when either exhausts or times out, and the associated hunt-pilot for coverage specifies Use Personal Preferences for its final forwarding.

You can configure each of these call forward types for internal and external calls that can be forwarded to voice messaging system, dialed destination number, or calling search space.

Cisco CallManager release 5.0 supports a secondary Calling Search Space (CSS) for Call Forward All (CFA) field. The secondary CSS for CFA combines with the existing CSS for CFA to allow the support of the alternate CSS system configuration. When CFA is activated, only the primary and secondary CSS for CFA get used to validate the CFA destination and redirect the call to the CFA destination. If these fields are empty, the null CSS gets used. The combination of the line CSS and device CSS no longer gets used when the CSS for CFA is None. Only the CSS fields that are configured in the primary CSS for CFA and secondary CSS for CFA fields get used. If CFA is activated from the phone, the CFA destination gets validated by using the CSS for CFA and the secondary CSS for CFA and the CFA destination gets written to the database. In previous releases, if the CSS for CFA is empty, the CFA destination got validated against the combination of the line CSS and device CSS of the phone. In this release, when the CFA is activated, the CFA destination always gets validated against the CSS for CFA and the secondary CSS for CFA.

The administrator can configure call forward information display options to the original dialed number or the redirected dialed number or both. The administrator can enable or disable the calling line ID (CLID) and calling name ID (CNID). The display option gets configured for each line appearance.

The call forward busy trigger gets configured for each line appearance in a cluster and cannot exceed the maximum number of calls that are configured for a line appearance. The call forward busy trigger determines how many active calls exist on a line before the call forward busy setting gets activated (for example, 10 calls).

The call forward no answer ring duration gets configured for each line appearance in a cluster, and the default specifies 12 seconds. The call forward no answer ring duration determines how long a phone rings before the call forward no answer setting gets activated.

Tip Keep the busy trigger slightly lower than the maximum number of calls, so users can make outgoing calls and perform transfers.

Configure call forward in the Directory Number Configuration window in Cisco CallManager Administration.

Call Waiting

Call waiting lets users receive a second incoming call on the same line without disconnecting the first call. When the second call arrives, the user receives a brief call-waiting indicator tone, which is configured with the Ring Setting (Phone Active) in the Directory Number Configuration window.

Configure call waiting in the Directory Number Configuration window in Cisco CallManager Administration by setting the busy trigger (greater than 2) and maximum number of calls.

Tip   To configure call waiting for phones with no display (such as the Cisco IP Phone model 30 VIP), set the busy trigger to 2 and the maximum number of calls to 2.

Making and Receiving Multiple Calls Per Directory Number

Cisco CallManager supports various behaviors when users make and receive multiple calls per DN: Transfer/Direct Transfer and Conference/Join.

Transfer allows different line appearances in one device to initiate independent transfer transactions and allows multiple transfer transactions per line appearance per device.

Conference allows different line appearances in one device to initiate independent conference transactions and allows multiple conference transactions per line appearance per device.

Note   Devices that do not support multicall display, such as Cisco IP Phone model 7910, cannot transfer or conference two existing calls together.

Transfer and Conference Behavior

If only one active call exists on the directory number, the first invocation of a feature results in putting the active call on hold and initiating a new call by using the same directory number. When the new call gets set up, the second invocation of the same feature starts the feature operation. The first invocation of Transfer/Conference will always initiate a new call by using the same directory number, after putting the active call on hold.

Direct Transfer and Join Behavior

The following information describes Direct Transfer and Join behavior:

- Direct Transfer joins two established calls (call is in hold or in connected state) into one call and drops the feature initiator from the call. Direct Transfer does not initiate a consultation call and does not put the active call on hold.

- Join does not create a consultation call and does not put the active call on hold. To implement Join, choose at least two calls and then press the Join softkey on one of the calls. Join can include more than two calls, which results in a call with more than three parties. Join supports up to 16 participants in a call. To choose an active or held call, highlight the call and press the "Select" softkey. A selected call shows a checked indicator next to it on the phone. The call that initiates the Join automatically gets included, even if it is not selected.

Directory Number Search

The following sections describe how to modify your search to locate a directory number. If you have thousands of directory numbers in your network, you may need to limit your search to find the directory number that you want. If you cannot locate a directory number, you may need to expand your search to include more directory numbers.

Note   Be aware that the directory number search is not case sensitive.

Searching by Directory Number

To search for a phone by its directory number (DN), choose Directory Number and either enter a search criteria (such as begins with or ends with) or click the **Find** button.

Note   Some directory numbers do not associate with phones. To search for those directory numbers, which are called unassigned DN, use the Route Plan Report window.

Searching by Route Partition

To search for a phone by its route partition, choose Route Partition and either enter a search criteria (such as begins with or ends with) or click the **Find** button.

Searching by Description

To search for a phone by its description, choose Description and either enter a search criteria (such as begins with or ends with) or click the **Find** button.

Search Within Results

To refine your search results, you can search for additional information. For example, if you search for directory numbers by directory number, you may want to search within the directory number results for DNs that share the same route partition. After you perform an initial search, check the Search Within Results check box. You can enter additional, or different, search criteria in the drop-down list boxes. Click **Find** again to search within the previous results.

Finding All Directory Numbers in the Database

To find all directory numbers that are registered in the database, choose Directory Number from the list of fields; choose "is not empty" from the list of patterns; then, click the **Find** button.

Dependency Records

If you need to find out the directory numbers that a specific phone is using or the phones to which a directory number is assigned, choose Dependency Records from the Related Links drop-down list box on the Cisco CallManager Administration Phone Configuration or Directory Number Configuration window. The Dependency Records Summary window displays information about directory numbers that are using the phone. To find out more information about the directory number, click the directory number and the Dependency Records Details window displays. If the dependency records are not enabled for the system, the dependency records summary window displays a message.

For more information about Dependency Records, refer to the "Accessing Dependency Records" section and the "Removing a Directory Number from a Phone" section in the *Cisco CallManager Administration Guide*.

Directory Number Configuration Checklist

Table 18-1 provides steps to manually configure a directory number in Cisco CallManager Administration. If you are using autoregistration, Cisco CallManager adds the phone and automatically assigns the directory number.

Table 18-1   Directory Number Configuration Checklist

Configuration Steps		Procedures and Related Topics
Step 1	If you want to configure a DN for a phone, add and configure the phone. You may need the following information about the phone: • Model • MAC address • Physical location of the phone • Cisco CallManager user to associate with the phone • Partition, calling search space, and location information, if used • Number of lines and associated DNs to assign to the phone	Configuring Cisco IP Phones, *Cisco CallManager Administration Guide*
Step 2	Add and configure lines (DNs). Configure DNs either from the Directory Number Configuration window or, if you want to configure a DN for a phone, from the Phone Configuration window. You can also configure phone features such as call park, call forward, and call pickup.	Configuring a Directory Number, *Cisco CallManager Administration Guide* Configuring Cisco IP Phones, *Cisco CallManager Administration Guide*
Step 3	Configure speed-dial buttons. You can configure speed-dial buttons for phones if you want to provide speed-dial buttons for users or if you are configuring phones that do not have a specific user who is assigned to them. Users can change the speed-dial settings on their phones by using Cisco IP Phone User Options.	Configuring Speed-Dial Buttons, *Cisco CallManager Administration Guide*
Step 4	Configure Cisco IP Phone services. You can configure services for Cisco IP Phone models 7970, 7960, 7940, 7912, and 7905 and Cisco IP Communicator if you want to provide services for users or if you are configuring phones that do not have a specific user who is assigned to them. Users can change the services on their phones by using the Cisco IP Phone User Options.	Configuring Cisco IP Phones, *Cisco CallManager Administration Guide*

Table 18-1   Directory Number Configuration Checklist (continued)

Configuration Steps		Procedures and Related Topics
Step 5	Customize phone button templates and softkey templates, if required. Configure templates for each phone.	Configuring Phone Button Templates, *Cisco CallManager Administration Guide* Configuring Cisco IP Phones, *Cisco CallManager Administration Guide* Adding Nonstandard Softkey Templates, *Cisco CallManager Administration Guide*
Step 6	Assign services to phone buttons, if required.	Adding a Cisco IP Phone Service to a Phone Button, *Cisco CallManager Administration Guide*
Step 7	Provide power, install, verify network connectivity, and configure network settings for the Cisco IP Phone.	*Cisco IP Phone Administration Guide for Cisco CallManager*
Step 8	Associate a user with the phone (if required).	Associating Devices to an End User, *Cisco CallManager Administration Guide*

Where to Find More Information

Related Topics

- Cisco IP Phones, page 43-1
- Voice Mail Connectivity to Cisco CallManager, page 29-1
- Call Pickup Group, page 34-1
- Directory Number Configuration, *Cisco CallManager Administration Guide*
- Enabling Autoregistration, *Cisco CallManager Administration Guide*
- Configuring Cisco IP Phones, *Cisco CallManager Administration Guide*
- Associating Devices to an End User, *Cisco CallManager Administration Guide*
- User/Phone Add Configuration, *Cisco CallManager Administration Guide*
- Phone Button Template Configuration, *Cisco CallManager Administration Guide*
- Service Parameters Configuration, *Cisco CallManager Administration Guide*
- Barge and Privacy, *Cisco CallManager Features and Services Guide*
- Call Park, *Cisco CallManager Features and Services Guide*
- Immediate Divert, *Cisco CallManager Features and Services Guide*
- Quality Report Tool, *Cisco CallManager Features and Services Guide*

Additional Cisco CallManager Documentation

- Phone administration documentation that supports your phone model and this version of Cisco CallManager
- Cisco IP Phone user documentation, including Getting Started documents
- Firmware release notes for your phone model
- *Cisco CallManager Bulk Administration Guide*

- *Cisco CallManager Security Guide*
- *Cisco IP Manager Assistant User Guide*
- *Cisco IP Communicator Administration Guide*