



Understanding Route Plans

The Route Plan drop-down list on the menu bar allows you to configure Cisco CallManager route plans using route patterns, route filters, route lists, and route groups.

This section contains descriptions of the following route plan concepts:

- [Route Plan Overview, page 13-1](#)
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Route Plan Overview

The Cisco CallManager uses the route plan to route both internal calls and external, public switched telephone network (PSTN) calls.

Route patterns, route filters, route lists, and route groups provide flexibility in network design. Route patterns work in conjunction with route filters to direct calls to specific devices and to include or exclude specific digit patterns. Use route patterns to include and exclude digit patterns. Use route filters primarily to include digit patterns. Route lists control the selection order of the route groups. Route groups set the selection order of the gateway devices.

You can assign route patterns to gateways, or to a route list that contains one or more route groups. Route groups determine the order of preference for gateway and port usage. Route groups allow overflows from busy or failed devices to alternate devices.

Route lists determine the order of preference for route group usage. If a route list is configured, you must configure at least one route group. One or more route lists can point to one or more route groups.

Route filters may restrict certain numbers from being routed that are otherwise allowed by a route pattern. Tags, or clauses, provide the core component of route filters. A tag applies a name to a portion of the dialed digits. For example, the North American Numbering Plan (NANP) number 972-555-1234 contains the LOCAL-AREA-CODE (972), OFFICE-CODE (555), and SUBSCRIBER (1234) tags.

**Note**

The NANP designates the numbering plan for the PSTN in the United States and its territories, Canada, Bermuda, and many Caribbean nations. It includes any number that can be dialed and is recognized in North America.

Route patterns represent all valid digit strings. When you assign a directory number to a Cisco IP phone, you assign it a route pattern (the directory number is the route pattern). Cisco Analog Access Trunk Gateways, Cisco Digital Access Trunk Gateways, Cisco MGCP gateways, H.323-compliant gateways also use route patterns. Cisco gateways can route ranges of numbers with complex restrictions and manipulate directory numbers before the Cisco CallManager passes them on to an adjacent system. The adjacent system can be a central office (CO), a private branch exchange (PBX), or a gateway on another Cisco CallManager system.

You can assign a route pattern directly to a Cisco Access Gateway, or you can assign it to a route list for more flexibility. For example, in [Figure 13-1](#) shows Cisco Digital Access Gateway 1 designated as the first choice for routing outgoing calls to the PSTN.

**Tip**

If a gateway does not have a route pattern, it cannot place calls to the PSTN or to a PBX. To assign a route pattern to an individual port on a gateway, you must assign a route list and a route group to that port.

**Note**

A gateway port can only belong to one route group; however, a route group can be assigned to multiple route lists.

[Figure 13-1](#) shows the effects of using route patterns with Cisco Digital Access Gateways. This example assigns the route pattern to a route list, and that route list associates with a single route group. The route group supports a list of devices that are selected based on availability. If all ports on the first-choice gateway are busy or out of service, the call routes to the second-choice gateway.

**Note**

If a route pattern is associated with a gateway, then if all the resources of that gateway are used, the call is not routed.

Figure 13-1 Route Plan Summary Diagram for Cisco Digital Access Gateways

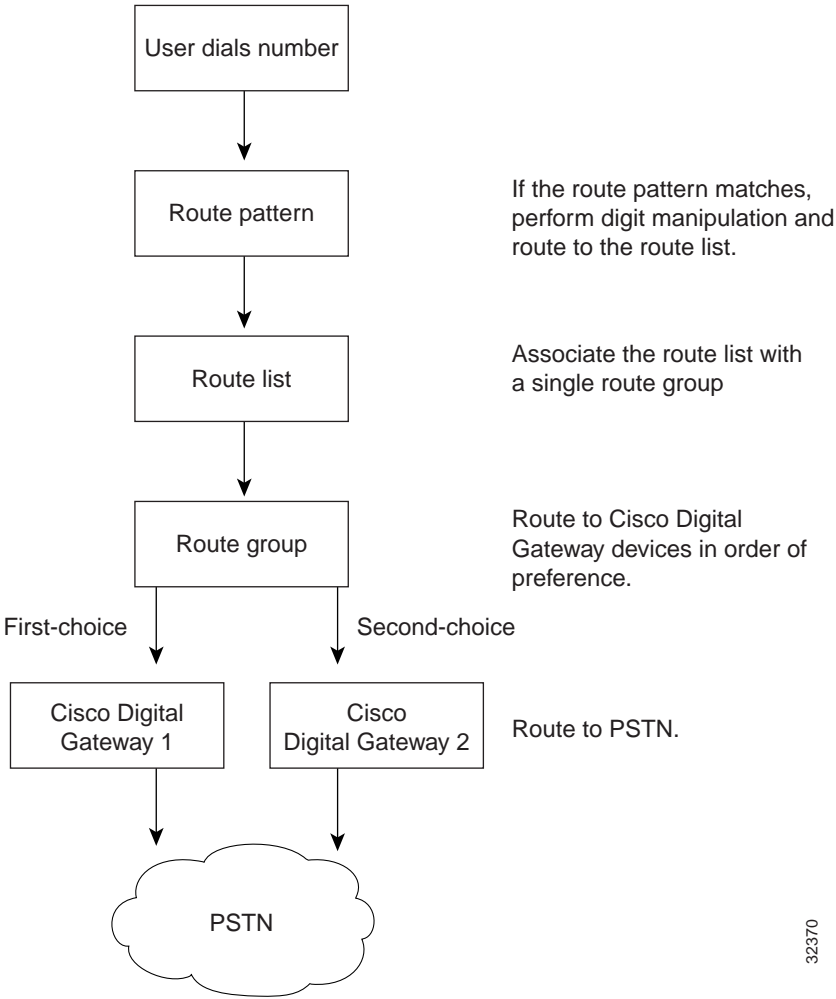
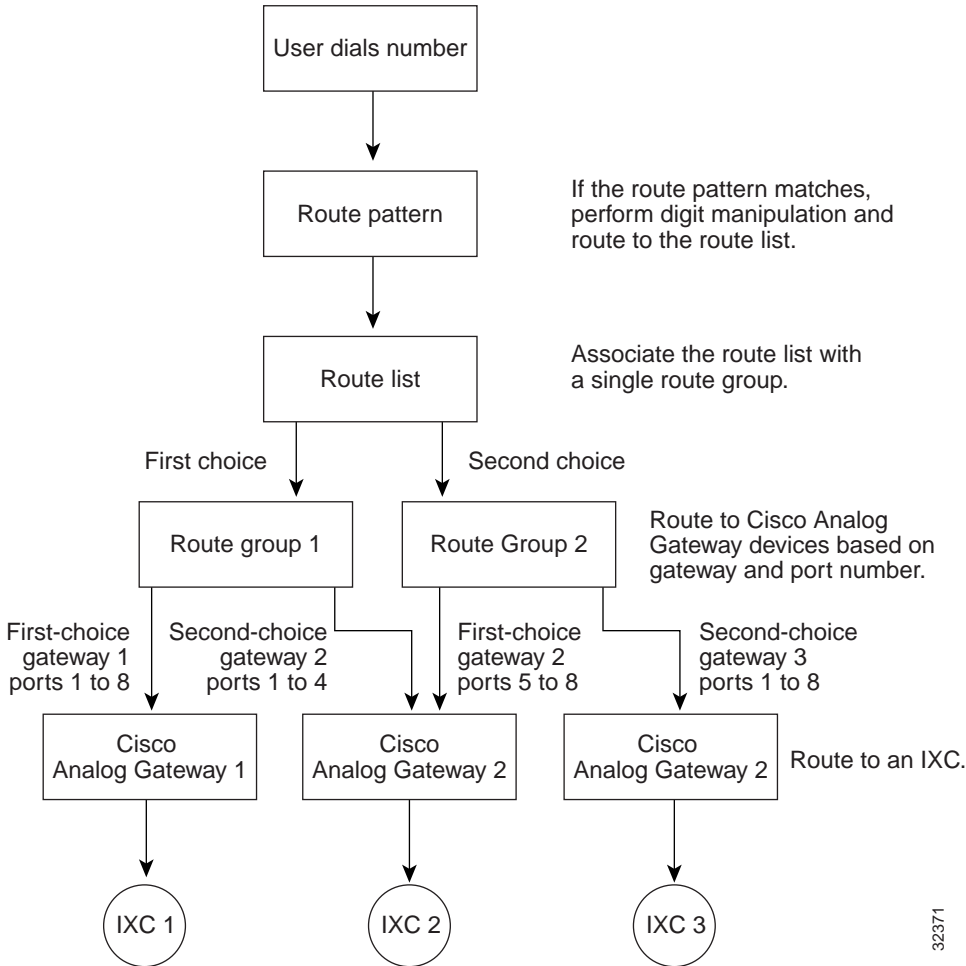


Figure 13-2 shows the effects of using route patterns with Cisco Analog Access Gateways. This example assigns the route pattern to a route list, and that route list associates with two route groups. Route group 1 associates with ports 1 through 8 on gateway 1, which routes all calls to interexchange carrier 1 (IXC 1). Route group 1 also associates with ports 1 through 4 on gateway 2. Route group 2 associates with ports 5 through 8 on gateway 2 and all ports on gateway 3.

Each route group supports a list of devices that are selected based on availability. For route group 1, if ports 1 through 8 on the first-choice gateway are busy or out of service, calls route to ports 1 through 4 on the second-choice gateway. If all routes in route group 1 are unavailable, calls route to route group 2. For route group 2, if ports 5 through 8 on the first-choice gateway are busy or out of service, calls route to ports 1 through 8 on the second-choice gateway. If no ports on any gateway in either route group are available, the call routes to an all trunks busy tone.

Figure 13-2 Route Plan Summary Diagram for Cisco Analog Access Gateways



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Route Pattern Wildcards and Special Characters

Route pattern wildcards and special characters allow a single route pattern to match a range of numbers (addresses). Also use these wildcards and special characters to build instructions that enable the Cisco CallManager to manipulate a number before sending it to an adjacent system.

The “[Special Characters and Settings](#)” section on page 20-1 describes the wildcards and special characters supported by Cisco CallManager.

Closest-Match Routing

Closest-match routing process routes a call using the route pattern that most closely matches the dialed number. When the Cisco CallManager encounters a dialed number that matches multiple route patterns, it uses closest-match routing to determine which route pattern most closely matches the number and directs the call using that route pattern.

When two configured route patterns match exactly the same number of addresses in different partitions, Cisco CallManager chooses the route pattern based on order in which the partitions are listed in the calling search space. (Cisco CallManager chooses the route pattern from the partition that appears first in the calling search space.)

If two configured route patterns match exactly the same number of addresses in a partition, the Cisco CallManager arbitrarily chooses one. The following paragraphs explain why such exact matches signify an unusual occurrence.

It is possible to configure several route patterns that match a single number. For instance, the number 8912 matches all the following route patterns: 8912, 89XX, and 8XXX.

In this example, the route pattern 8912 matches exactly one address. The route pattern 89XX matches 8912 plus 99 other addresses, and the route pattern 8XXX matches 8912 plus 999 other addresses.

If the user dials 8913, the call routes differently. Using the preceding example, this address matches only the routing patterns 89XX and 8XXX. Since 89XX matches a narrower range of addresses than 8XXX, the Cisco CallManager delivers the call to the device assigned the routing pattern 89XX.

Using the @ wildcard character in a route pattern requires additional consideration.

The number 92578912 matches both of the following route patterns: 9.@ and 9.XXXXXXX. Even though both of these route patterns seem to equally match the address, the 9.@ route pattern actually provides the closest match. The @ wildcard character encompasses many different route patterns, and one of those

route patterns is [2-9]XXXXXX. Since the number 2578912 more closely matches [2-9]XXXXXX than it does XXXXXXX, the 9.@ route pattern provides the closest match for routing.

Discard Digits Instructions

A discard digits instruction (DDI) removes a portion of the dialed digit string before passing the number on to the adjacent system. Portions of the digit string must be removed, for example, when an external access code is needed to route the call to the PSTN, but that access code is not expected by the PSTN switch.

The [“Special Characters and Settings” section on page 20-1](#) lists DDIs and describes the effects of applying each DDI to a dialed number.

Route Patterns

Cisco CallManager uses route patterns to route or block both internal and external calls. A directory number specifies a type of specific route pattern that is applied to a Cisco IP Phone. Gateways and Cisco IP phones can also use more complex route patterns that can contain wildcards.



Caution

If a gateway has no route pattern associated with it, or it does not belong to a route group, it cannot route/block any calls.



Tip

You must reset gateways for new or updated routing information to be recognized. Resetting the gateway may result in a dropped call.

The simplest route pattern just specifies a set of one or more digits. For example, the number 8912 specifies a route pattern. When assigned to a Cisco Access gateway or a route list, the Cisco CallManager directs any calls to 8912 to the assigned device.

Considerations for Using Route Patterns

When using route patterns, take the following considerations into account:

- If the route pattern contains an at symbol (@), the Discard Digits field can specify any of the PreAt discard digits instructions (DDIs).
- When @ is used in a routing pattern, the system recognizes octothorpe (#) automatically as an end-of-dialing character for international calls. For routing patterns that don't use @, you must include the # in the routing pattern to be able to use the # character to signal the end of dialing.

**Note**

The only Discard Digits instructions you may use with non-@ patterns are <None>, NoDigits, and PreDot.

External Route Plan Wizard

The external route plan wizard generates a single-tenant, multilocation, partitioned route plan for the North American Numbering Plan (NANP) area using information provided by the administrator through a series of prompts.

The route plan generated by the external route plan wizard includes the following elements:

- Route filters
- Route groups
- Route lists
- Route patterns
- Partitions
- Calling search spaces
- Calling party and calling party transformations
- Access code manipulation

The following topics describe the basic concepts used when you generate route plans with the external route plan wizard:

- [Generated Route Filters, page 13-10](#)
- [Generated Route Groups, page 13-11](#)

- [Generated Route Lists, page 13-12](#)
- [Generated Route Patterns, page 13-14](#)

Generated Route Filters

A generated route filter permits or restricts access through a route list using route patterns. The external route plan wizard associates each route list with a particular route filter. It names route filters using the TenantLocationCalltype convention, and appends the suffix RF to each route filter for easy identification.

[Table 13-1](#) shows the seven types of route lists that use route filters. The examples shown in this table use specific route filter names and actual access and area codes for better readability.

Table 13-1 Route Lists and Associated Route Filters

Route List Type	Route Filter Name and Content Examples
911 calls	Name: CiscoDallas911RF Content: 9.@ where (SERVICE == 911)
Local calls with metro (7- and 10-digit) dialing	Name: CiscoDallasLocalRF Content: 9.@ where (LOCAL-AREA-CODE == 972) OR (LOCAL-AREA-CODE == 214)
Local calls with 10-digit dialing	Name: CiscoDallasLocal10DCallRF Content: 9.@ where (LOCAL-AREA-CODE == 972) OR (LOCAL-AREA-CODE == 214)
Local calls with 7-digit dialing	Name: CiscoDallasLocal7DCallRF Content: 9.@ where (AREA-CODE DOES_NOT_EXIST) AND (LOCAL-AREA-CODE DOES_NOT_EXIST)
Toll bypass calls	Name: CiscoTollByPassToDallasRF Content: 9.@ where (AREA-CODE == 972) OR (AREA-CODE == 214)

Table 13-1 Route Lists and Associated Route Filters (continued)

Route List Type	Route Filter Name and Content Examples
Long-distance calls	Name: CiscoDallasLongDistanceRF Content: 9.@ where (AREA-CODE EXISTS)
International calls	Name: CiscoDallasIntIRF Content: 9.@ where (INTERNATIONAL-ACCESS EXISTS)

Generated Route Groups

A generated route group sets the order of preference for gateway and port usage. The external route plan wizard assigns one gateway to each generated route group. The wizard uses all ports on the gateways. It does not support using partial resources for generated external route plans.

The external route plan wizard names route filters using the TenantLocationGatewaytypeNumber convention for easy identification. The following list shows the gateway type abbreviations:

- AA: analog access
- DA: digital access
- HT: H.323 trunk
- MS: MGCP station
- MT: MGCP trunk

The external route plan wizard identifies route groups associated with multiple gateways of the same type by attaching a number suffix to all route groups. For example, if three MGCP trunk gateways exist at the Cisco Dallas location, the external route plan wizard names the associated route groups CiscoDallasMT1, CiscoDallasMT2, and CiscoDallasMT3.

If a route list includes more than one route group and more than one gateway (with one gateway for each route group), an arbitrary order designates how the external route plan wizard lists the route groups. The only order imposed ensures that route groups associated with the local gateways are listed before the route groups associated with remote gateways. If needed, manually change the order after the route plan is generated.



Note Cisco CallManager treats all gateways belonging to a location as shared resources for that location.

Generated Route Lists

A generated route list sets the order of preference for route group usage and defines the route filters applied to those route groups. The external route plan wizard creates between five and seven route lists for each location depending on the types of local dialing choices available. Therefore, the total number of route lists depends on the local dialing scheme and the number of locations served by the route plan.

Using the TenantLocationCalltype convention, the external route plan wizard names route lists and appends the suffix RL to each route list for easy identification.

[Table 13-2](#) shows the eight types of route lists. The example shown in this table use specific route list names for better readability.

Table 13-2 *Route List Types*

Route List Type	Example Route List Name and Usage
911 calls	Name: CiscoDallas911RL Use: This route list type applies for 911 emergency calls.
Enterprise calls	Name: CiscoDallasEnterpriseRL Use: This route list type applies for route plans that include Cisco CallManager to adjacent PBX calls. If the route plan does not include routing to an adjacent PBX, the wizard does not generate this route list type.

Table 13-2 Route List Types (continued)

Route List Type	Example Route List Name and Usage
Local calls with metro dialing	<p>Name: CiscoDallasLocalRL</p> <p>Use: This route list type applies for route plans that encompass both 7- and 10-digit dialing areas. This route list type generates two route lists: one for 7-digit dialing and another for 10-digit dialing. If you chose to generate a route plan using metro route lists, you cannot also choose 7- or 10-digit dialing route lists.</p>
Local calls with 10-digit dialing	<p>Name: CiscoDallasLocal10DCallRL</p> <p>Use: This route list type applies for route plans that use 10-digit dialing. This route list type generates one route list for 10-digit dialing. If you chose to generate a route plan using a 10-digit dialing route list, you cannot also choose 7-digit or metro dialing route lists.</p>
Local calls with 7-digit dialing	<p>Name: CiscoDallasLocal7DCallRL</p> <p>Use: This route list type applies for route plans that use 7-digit dialing. This route list type generates one route list for 7-digit dialing. If you chose to generate a route plan using a 7-digit dialing route list, you cannot also choose 10-digit or metro dialing route lists.</p>
Toll bypass calls	<p>Name: CiscoTollByPassToDallasRL</p> <p>Use: This route list type applies for intracluster calls that originate from a remote location, and get routed out the local gateway as local calls.</p>
Long distance calls	<p>Name: CiscoDallasLongDistanceRL</p> <p>Use: This route list type applies for long distance toll calls.</p>
International calls	<p>Name: CiscoDallasIntlRL</p> <p>Use: This route list type applies for international toll calls.</p>

Generated Route Patterns

A generated route pattern directs calls to specific devices and either includes or excludes specific dialed-digit strings. The external route plan wizard only generates route patterns that require an access code prefix. The typical route pattern for routing a call to the PSTN has the prefix construction 9.@. The typical route pattern for routing a call to the PBX has the prefix construction 9.9@.

The external route plan wizard associates a route list, a route filter, and a partition with each route pattern. The route pattern provides the appropriate calling party transform mask, called party transform mask, digit discard instructions, and prefix digits for the associated route list.

The wizard bases route patterns for calls to an adjacent PBX on the access code and the range of directory numbers served by that PBX. For example, if the access code used to direct calls to the adjacent PBX is 9 and the range of directory numbers served by that PBX is 1000 through 1999, then the external route plan wizard generates the route pattern 9.1XXX for enterprise calls.

Route Plan Report

The route plan report comprises a listing of all call park numbers, call pickup numbers, conference numbers (Meet-Me numbers), route patterns, and translation patterns in the system. The route plan report allows you to view either a partial or full list and to go directly to the associated configuration windows, by selecting a route pattern, partition, route group, route list, call park number, call pickup number, conference number (Meet-Me number), or gateway.

In addition, the route plan report allows you to save report data into a .csv file that you can import into other applications such as the Bulk Administration Tools (BAT). The .csv file contains more detailed information than the web pages, including directory numbers (DN) for phones, route patterns, and translation patterns. Refer to the “[Route Plan Report](#)” section in the *Cisco CallManager Administration Guide* for more information.

Where to Find More Information

Related Topic

- [Partitions and Calling Search Spaces, page 12-1](#)

Related Cisco Documentation

- [Partition Configuration](#), *Cisco CallManager Administration Guide*
- [Calling Search Space Configuration](#), *Cisco CallManager Administration Guide*
- *Cisco IP Telephony Network Design Guide*

■ Where to Find More Information