

# Describe Administrative Distance

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## Introduction

This document describes administrative distance, the feature that routers use in order to select the best path when there are more than two options.

## Prerequisites

### Requirements

Cisco recommends that you have basic knowledge of the routing process. Refer to [Routing Basics in Internetworking Technologies Handbook](#) <sup>1</sup>.

### Components Used

This document is not restricted to specific software and hardware versions.

The information in this document was created from the devices in a specific lab environment. All of the devices used in this document started with a cleared (default) configuration. If your network is live, ensure that you understand the potential impact of any command.

## Background Information

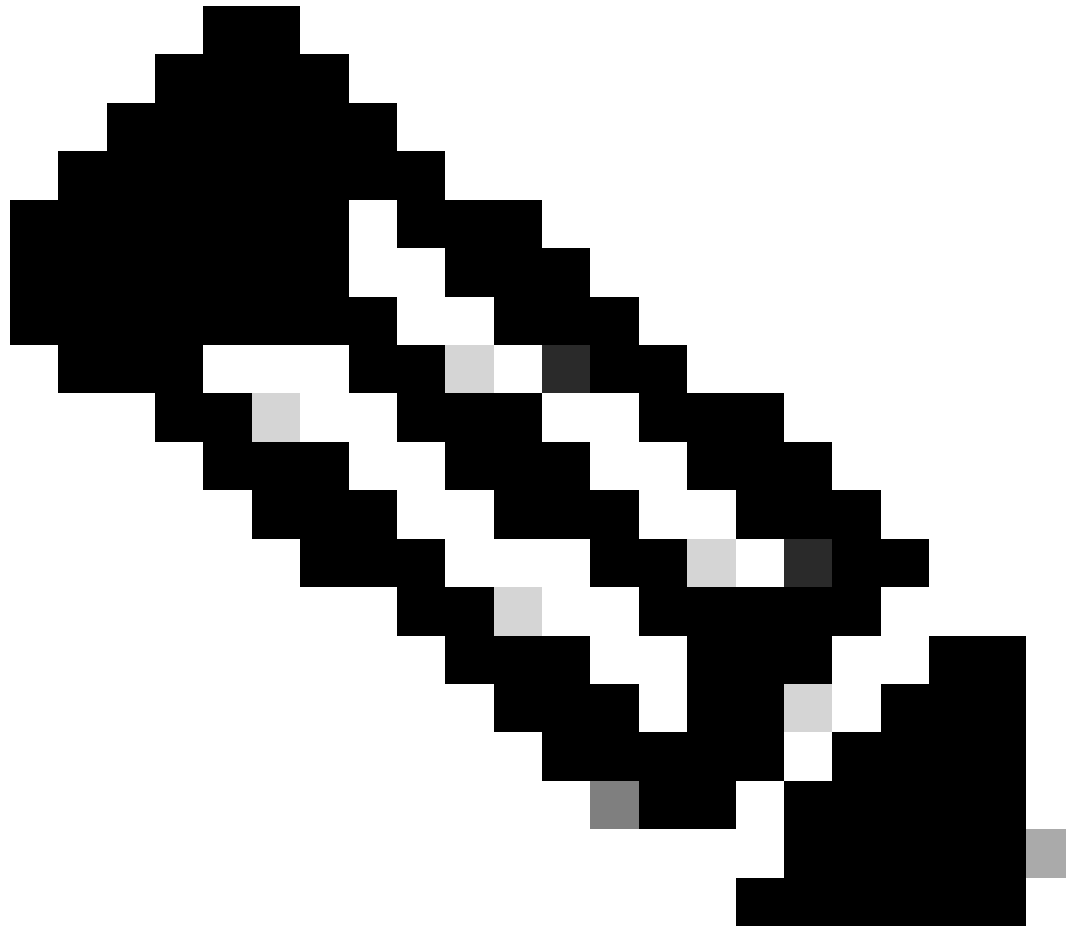
Routers use administrative distance in order to select the best path when there are two or more different routes to the same destination from two different routing protocols.

Most routing protocols have metric structures and algorithms that are not compatible with other protocols. In a network with multiple routing protocols, the exchange of route information and the capability to select the best path across the multiple protocols are critical. Administrative distance defines the reliability of a routing protocol. Each routing protocol is prioritized in order of most to least reliable (believable) with the help of an administrative distance value.

## Select the Best Path

Administrative distance is the first criterion that a router uses to determine which routing protocol to use if two protocols provide route information for the same destination. Administrative distance is a measure of the trustworthiness of the source of the routing information. Administrative distance has only local significance, and is not advertised in routing updates.

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**Note:** The smaller the administrative distance value, the more reliable the protocol. For example, if a router receives a route to a certain network from both Open Shortest Path First (OSPF) (default administrative distance - 110) and Enhanced Interior Gateway Routing Protocol (EIGRP) (default administrative distance - 90), the router chooses EIGRP because EIGRP is more reliable. This means the router adds the EIGRP version of the route to the routing table.

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In the previous example, if you lose the source of the EIGRP-derived information (for example, due to a power shutdown), the software uses the OSPF-derived information until the EIGRP-derived information reappears.

### Default Distance Value Table

This table lists the administrative distance default values of the protocols that Cisco supports.

Route Source	Default Distance Values
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Connected interface	0
Static route	1
Enhanced Interior Gateway Routing Protocol (EIGRP) summary route	5
External Border Gateway Protocol (BGP)	20
Internal EIGRP	90
Interior Gateway Routing Protocol (IGRP)	100
Open Shortest Path First (OSPF)	110
Intermediate System-to-Intermediate System (IS-IS)	115
Routing Information Protocol (RIP)	120
Exterior Gateway Protocol (EGP)	140
On Demand Routing (ODR)	160
External EIGRP	170
Internal BGP	200
Unknown*	255

\* If the administrative distance is 255, the router does not believe the source of that route and does not install the route in the routing table.

When you use route redistribution, occasionally you need to modify the administrative distance of a protocol so that it takes precedence. For example, if you want the router to select RIP-learned routes (default value 120) rather than IGRP-learned routes (default value 100) to the same destination, you must increase the administrative distance for IGRP to 120+, or decrease the administrative distance of RIP to a value less than 100.

You can modify the administrative distance of a protocol through the `distance` command in the routing process subconfiguration mode. This command specifies that the administrative distance is assigned to the routes learned from a particular routing protocol. You need to use this procedure generally when you migrate the network from one routing protocol to another, and the latter has a higher administrative distance. However, a change in the administrative distance can lead to routing loops and black holes. So, use caution if you change the administrative distance.

Here is an example that shows two routers, R1 and R2, connected through Ethernet. The loopback interfaces of the routers are also advertised with RIP and IGRP on both the routers. You can observe that the IGRP routes are preferred over the RIP routes in the routing table because the administrative distance is 100.

```
<#root>
```

```
R1#
```

```
show ip route
```

```
Gateway of last resort is not set
```

```
172.16.0.0/24 is subnetted, 1 subnets
C 172.16.1.0 is directly connected, Ethernet0
I 10.0.0.0/8 [100/1600] via 172.16.1.200, 00:00:01, Ethernet0
C 192.168.1.0/24 is directly connected, Loopback0
```

```
R2#
```

```
show ip route
```

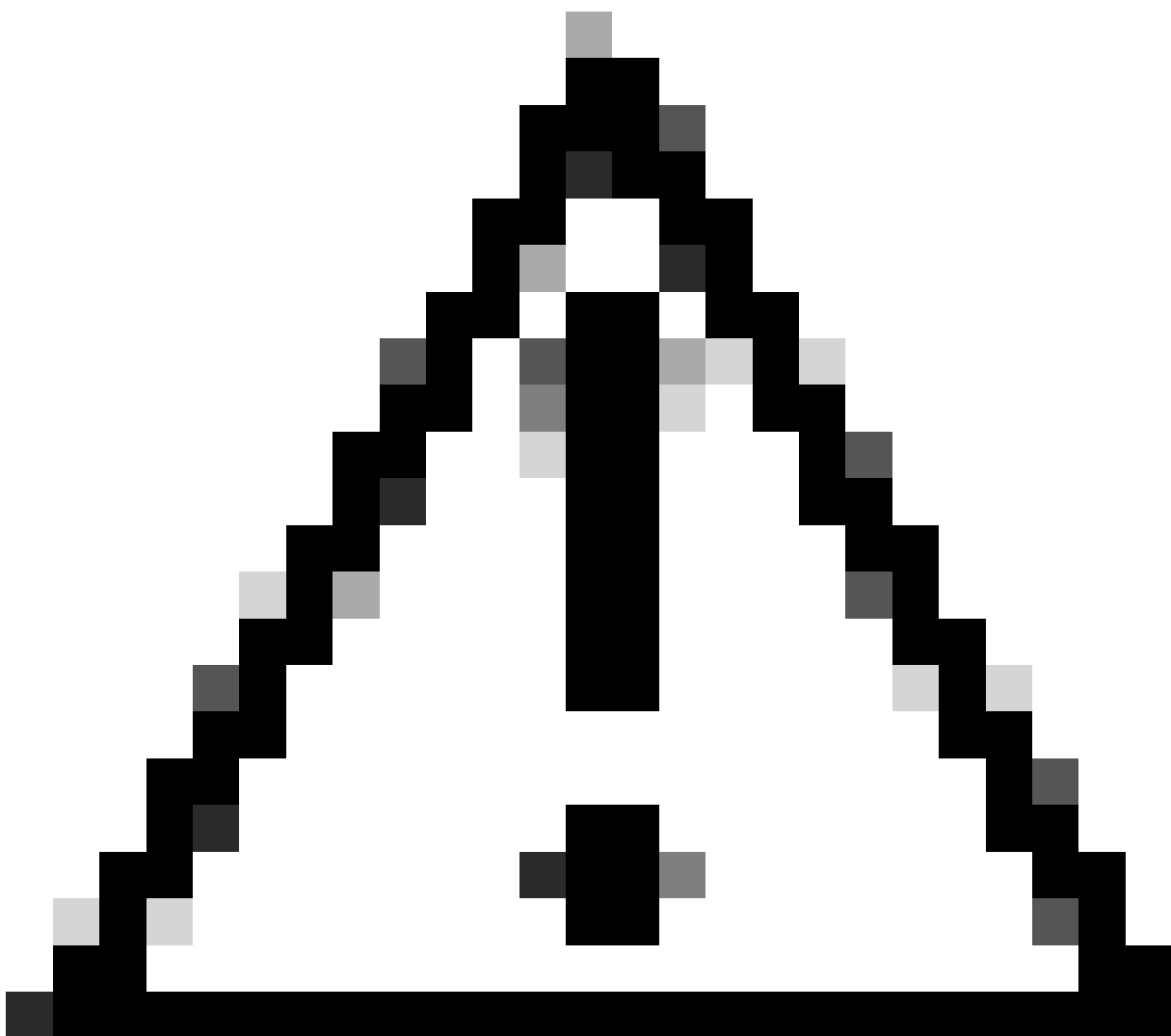
```
Gateway of last resort is not set
```

```
172.16.0.0/24 is subnetted, 1 subnets
C 172.16.1.0 is directly connected, Ethernet0
C 10.0.0.0/8 is directly connected, Loopback0
I 192.168.1.0/24 [100/1600] via 172.16.1.100, 00:00:33,
```

In order to enable the router to prefer RIP routes to IGRP, configure the `distance` command on R1 like this:

```
<#root>
R1(config)#
router rip
R1(config-router)#
distance 90
```

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**Caution:** This example shows how to modify the Administrative Distance of the protocol, however, you need to be careful when evaluating a change to Administrative Distance, as it can

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cause routing loops or suboptimal routing if not properly managed.

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Now look at the routing table. The routing table shows that the router prefers the RIP routes. The router learns RIP routes with an administrative distance of 90, although the default is 120. The new administrative distance value is relevant only to the routing process of a single router (in this case R1). R2 still has IGRP routes in the routing table.

```
<#root>
```

```
R1#
```

```
show ip route
```

```
Gateway of last resort is not set
```

```
172.16.0.0/24 is subnetted, 1 subnets  
C 172.16.1.0 is directly connected, Ethernet0  
R 10.0.0.0/8 [90/1] via 172.16.1.200, 00:00:16, Ethernet0  
C 192.168.1.0/24 is directly connected, Loopback0
```

```
R2#
```

```
show ip route
```

```
Gateway of last resort is not set
```

```
172.16.0.0/24 is subnetted, 1 subnets  
C 172.16.1.0 is directly connected, Ethernet0  
C 10.0.0.0/8 is directly connected, Loopback0  
I 192.168.1.0/24 [100/1600] via 172.16.1.100, 00:00:33,
```

There are no general guidelines to assign administrative distances because each network has varied requirements. You must determine a reasonable matrix of administrative distances for the network as a whole.

## Other Applications of Administrative Distance

One common reason to change the administrative distance of a route is when you use Static Routes to back up an IGP route that currently exists. This is normally used to bring up a backup link when the primary fails.

For example, assume that you use the routing table from R1. However, in this case, there is also an ISDN line that you can use as a backup if the primary connection fails. Here is an example of a Floating Static for this route:

```
ip route 10.0.0.0 255.0.0.0 Dialer 1 250
```

---

**Note:** The Administrative Distance is set to 250.

---

If the Ethernet interfaces fail, or if you manually bring down the Ethernet interfaces, the floating static route is installed into the routing table. All traffic destined for the 10.0.0.0/8 network is then routed out of the Dialer 1 interface and over the backup link. The routing table appears similar to this after the failure:

```
<#root>
R1#
show ip route

Gateway of last resort is not set
172.16.0.0/24 is subnetted, 1 subnets
C 172.16.1.0 is directly connected, Ethernet0

S 10.0.0.0/8 is directly connected, Dialer1

C 192.168.1.0/24 is directly connected, Loopback0
```

For more detailed information on the use of Floating Static routes, refer to these documents:

- [Sample Configuration: Using Floating Static Routes and Dial-on-Demand Routing](#)
- [Configuring ISDN Back With Floating Statics](#)
- [Evaluating Backup Interfaces, Floating Static Routes, and Dialer Watch for DDR Backup](#)

## **Related Information**

- [Route Selection in Cisco Routers](#)
- [IP Routing Support Page](#)
- [Technical Support & Documentation - Cisco Systems](#)