

Cisco – Configuring a Gateway of Last Resort Using IP Comm

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Configuring a Gateway of Last Resort Using IP Commands

Introduction

Before You Begin

- Conventions

- Prerequisites

- Components Used

ip default-gateway

ip default-network

- Flagging a Default Network

- Using Different Routing Protocols

ip route 0.0.0.0 0.0.0.0

Summary

Related Information

Introduction

This Tech Note explains how to configure a default route, or gateway of last resort, using the following IP commands: **ip default-gateway**, **ip default-network**, and **ip route 0.0.0.0 0.0.0.0**.

Before You Begin

Conventions

For more information on document conventions, see the Cisco Technical Tips Conventions.

Prerequisites

There are no specific prerequisites for this document.

Components Used

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

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

ip default-gateway

The **ip default-gateway** command differs from the other two commands in that it should only be used when **ip routing** is disabled on the Cisco router.

For instance, if the router is a host in the IP world, you can use this command to define a default gateway for it. You might also use this command when your low end Cisco router is in boot mode in order to TFTP a Cisco IOS® Software image to the router. In boot mode, the router does not have **ip routing** enabled.

ip default-network

Unlike the **ip default-gateway** command, you can use **ip default-network** when **ip routing** is enabled on the Cisco router. When you configure **ip default-network** the router considers routes to that network for installation as the gateway of last resort on the router.

For every network configured with **ip default-network**, if a router has a route to that network, that route is flagged as a candidate default route. Look at the following routing table taken from a Cisco router:

```
2513#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, * - candidate default
Gateway of last resort is not set
  161.44.0.0 255.255.255.0 is subnetted, 1 subnets
C      161.44.192.0 is directly connected, Ethernet0
S      198.10.1.0 [1/0] via 161.44.192.2
  131.108.0.0 255.255.255.0 is subnetted, 1 subnets
C      131.108.99.0 is directly connected, TokenRing0
```

Note the static route to 198.10.1.0 via 161.44.192.2 and that the gateway of last resort is not set. If you configure **ip default-network 198.10.1.0**, the routing table changes to the following:

```
2513#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, * - candidate default
Gateway of last resort is 161.44.192.2 to network 198.10.1.0
  161.44.0.0 255.255.255.0 is subnetted, 1 subnets
C      161.44.192.0 is directly connected, Ethernet0
S      161.44.0.0 255.255.0.0 [1/0] via 161.44.192.0
S*     198.10.1.0 [1/0] via 161.44.192.2
  131.108.0.0 255.255.255.0 is subnetted, 1 subnets
C      131.108.99.0 is directly connected, TokenRing0
2513#show ip protocols
2513#
```

You can see the gateway of last resort has now been set as 161.44.192.2. This result is independent of any routing protocol, as shown by the **show ip protocols** command at the bottom of the output.

You can add another candidate default route simply by configuring another instance of **ip default-network**:

```
2513#config terminal
Enter configuration commands, one per line. End with CNTL/Z.
2513(config)#ip route 171.70.24.0 255.255.255.0 131.108.99.2
2513(config)#ip default-network 171.70.24.0
2513(config)#^Z

2513#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, * - candidate default
Gateway of last resort is 161.44.192.2 to network 198.10.1.0
```

```

        161.44.0.0 255.255.255.0 is subnetted, 1 subnets
C       161.44.192.0 is directly connected, Ethernet0
S       161.44.0.0 255.255.0.0 [1/0] via 161.44.192.0
S*      198.10.1.0 [1/0] via 161.44.192.2
        171.70.0.0 is variably subnetted, 2 subnets, 2 masks
S       171.70.0.0 255.255.0.0 [1/0] via 171.70.24.0
S       171.70.24.0 255.255.255.0 [1/0] via 131.108.99.2
        131.108.0.0 255.255.255.0 is subnetted, 1 subnets
C       131.108.99.0 is directly connected, TokenRing0

```

Notice that after entering the above command, the network was not flagged as a default network. The following section explains why.

Flagging a Default Network

Note: The **ip default-network** command is classful, which means if the router has a route to the subnet indicated by this command, it installs the route to the major net. At this point neither network has been flagged as the default network. The **ip default-network** command must be issued again, using the major net, in order to flag the candidate default route.

```

2513#config terminal
Enter configuration commands, one per line. End with CNTL/Z.
2513(config)#ip default-network 171.70.0.0
2513(config)#^Z

2513#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, * - candidate default

Gateway of last resort is 161.44.192.2 to network 198.10.1.0

        161.44.0.0 255.255.255.0 is subnetted, 1 subnets
C       161.44.192.0 is directly connected, Ethernet0
S       161.44.0.0 255.255.0.0 [1/0] via 161.44.192.0
S*      198.10.1.0 [1/0] via 161.44.192.2
        171.70.0.0 is variably subnetted, 2 subnets, 2 masks
S*      171.70.0.0 255.255.0.0 [1/0] via 171.70.24.0
S       171.70.24.0 255.255.255.0 [1/0] via 131.108.99.2
        131.108.0.0 255.255.255.0 is subnetted, 1 subnets
C       131.108.99.0 is directly connected, TokenRing0

```

If the original static route had been to the major network, the extra step of configuring the default network twice would not have been necessary.

There are still no IP protocols running here. Without any dynamic protocols running, you can configure your router to choose from a number of candidate default routes based on whether the routing table has routes to networks other than 0.0.0.0/0. This command allows you to configure robustness into the selection of a gateway of last resort. Rather than configuring static routes to specific next-hops, you can have the router choose a default route to a particular network by checking in the routing table.

If you lose the route to a particular network, the router selects the second candidate default, as specified above. You can remove the lost route by removing the static route in the configuration as follows:

```

2513#config terminal
Enter configuration commands, one per line. End with CNTL/Z.
2513(config)#no ip route 198.10.1.0 255.255.255.0 161.44.192.2

```

```

2513(config)#^Z
2513#
%SYS-5-CONFIG_I: Configured from console by console

```

After removing the static route to the original default network, the routing table looks like this:

```

2513#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, * - candidate default

Gateway of last resort is 171.70.24.0 to network 171.70.0.0

    161.44.0.0 255.255.255.0 is subnetted, 1 subnets
C       161.44.192.0 is directly connected, Ethernet0
S       161.44.0.0 255.255.0.0 [1/0] via 161.44.192.0
*       171.70.0.0 is variably subnetted, 2 subnets, 2 masks
S*      171.70.0.0 255.255.0.0 [1/0] via 171.70.24.0
S       171.70.24.0 255.255.255.0 [1/0] via 131.108.99.2
    131.108.0.0 255.255.255.0 is subnetted, 1 subnets
C       131.108.99.0 is directly connected, TokenRing0
2513#

```

Using Different Routing Protocols

Gateways of last resort selected using the **ip default-network** command are propagated differently depending on which routing protocol is propagating the default route. For IGRP and EIGRP to propagate the route, the network specified by the **ip default-network** command must be known to IGRP or EIGRP. This means the network must be an IGRP- or EIGRP-derived network in the routing table, or the static route used to generate the route to the network must be redistributed into IGRP or EIGRP.

RIP advertises a route to 0.0.0.0. For example, note that the gateway of last resort on the router below was learned using the combination of the **ip route** and **ip default-network** commands. If you enable RIP on this router, RIP advertises a route to 0.0.0.0 (although not to the Token Ring network because of split-horizon):

```

2513(config)#router rip
2513(config-router)#network 161.44.0.0
2513(config-router)#network 131.108.0.0
2513(config-router)#^Z
2513#
2513#
2513#
%SYS-5-CONFIG_I: Configured from console by console
2513#debug ip rip
RIP protocol debugging is on
2513#
RIP: sending update to 255.255.255.255 via Ethernet0 (161.44.192.1)
      default 0.0.0.0, metric 1
      network 131.108.0.0, metric 1
RIP: sending update to 255.255.255.255 via TokenRing0 (131.108.99.1)
      network 161.44.0.0, metric 1
2513#

```

Note: In IOS release 12.0T and later, RIP does not advertise the default router if the route is not learned via RIP. Therefore, it may be necessary to redistribute the route into RIP, or use the **default-information originate** command.

OSPF, like RIP, advertises a route for 0.0.0.0 0.0.0.0. However, with OSPF, the router originating the default route must be configured with the **default-information originate** command. For more detailed information, see How Does OSPF Generate Default Routes?.

ip route 0.0.0.0 0.0.0.0

Creating a static route to network 0.0.0.0 0.0.0.0 is another way to set the gateway of last resort on a router. As with the **ip default-network** command, using the static route to 0.0.0.0 is not dependent on any routing protocols. However, **ip routing** must be enabled on the router.

Note: IGRP does not understand a route to 0.0.0.0, therefore it cannot propagate default routes created using the **ip route 0.0.0.0 0.0.0.0** command. Use the **ip default-network** command to have IGRP propagate a default route.

EIGRP propagates a route to network 0.0.0.0, but the static route must be redistributed into EIGRP. RIP and OSPF behave as described when using the **ip default-network** command. Keep in mind that the note above still applies.

Look at an example of configuring a gateway of last resort using the **ip route 0.0.0.0 0.0.0.0** command:

```
router-3#conf terminal
Enter configuration commands, one per line. End with CNTL/Z.
router-3(config)#ip route 0.0.0.0 0.0.0.0 170.170.3.4
router-3(config)#^Z
router-3#

router-3#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, * - candidate default
U - per-user static route, o - ODR
```

Gateway of last resort is 170.170.3.4 to network 0.0.0.0

```
170.170.0.0/24 is subnetted, 2 subnets
C 170.170.2.0 is directly connected, Serial0
C 170.170.3.0 is directly connected, Ethernet0
S* 0.0.0.0/0 [1/0] via 170.170.3.4
router-3#
router-3#
```

Note: If you configure multiple networks as candidate default routes using the **ip default-network** command, the network that has the lowest administrative distance is chosen as the network for the gateway of last resort. If all the networks have the same administrative distance then the network listed first in the routing table (**show ip route** lists the routing table) is chosen as the network for the gateway of last resort. If you use both the **ip default-network** and **ip route 0.0.0.0 0.0.0.0** commands to configure candidate default networks, and the network used by the **ip default-network** command is known statically, the network defined with the **ip default-network** command takes precedence and is chosen for the gateway of last resort. Otherwise if the network used by the **ip default-network** command is derived by a routing protocol, the **ip route 0.0.0.0 0.0.0.0** command, which will have a lower administrative distance, takes precedence and is chosen for the gateway of last resort. Lastly, if you use multiple **ip route 0.0.0.0 0.0.0.0** commands to configure a default route, traffic is load-balanced over the multiple routes.

Summary

To summarize, you can use the **ip default-gateway** command when **ip routing** is disabled on a Cisco router. Use the **ip default-network** and **ip route 0.0.0.0 0.0.0.0** commands to set the gateway of last resort on Cisco routers that have **ip routing** enabled. The way in which routing protocols propagate the default route information varies for each protocol.

Related Information

- [TCP/IP Routing and Routed Protocols Support Page](#)
 - [Technical Support – Cisco Systems](#)
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