



# Policy-Based Routing Default Next-Hop Routes

The Policy-Based Routing Default Next-Hop Route feature introduces the ability for packets that are forwarded as a result of the **set ip default next-hop** command to be switched at the hardware level. In prior software releases, the packets to be forwarded that are generated from the route map for policy-based routing are switched at the software level.

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## Finding Feature Information

Your software release may not support all the features documented in this module. For the latest caveats and feature information, see [Bug Search Tool](#) and the release notes for your platform and software release. To find information about the features documented in this module, and to see a list of the releases in which each feature is supported, see the feature information table.

Use Cisco Feature Navigator to find information about platform support and Cisco software image support. To access Cisco Feature Navigator, go to <https://cfng.cisco.com/>. An account on Cisco.com is not required.

## Information About Policy-Based Routing Default Next-Hop Routes

### Policy-Based Routing

Policy-based routing (PBR) is a process whereby the device puts packets through a route map before routing them. The route map determines which packets are routed to which device next. You might enable policy-based routing if you want certain packets to be routed some way other than the obvious shortest path. Possible applications for policy-based routing are to provide equal access, protocol-sensitive routing, source-sensitive routing, routing based on interactive versus batch traffic, and routing based on dedicated links. Policy-based routing is a more flexible mechanism for routing packets than destination routing.

To enable policy-based routing, you must identify which route map to use for policy-based routing and create the route map. The route map itself specifies the match criteria and the resulting action if all of the match clauses are met.

To enable policy-based routing on an interface, indicate which route map the device should use by using the **ip policy route-map** *map-tag* command in interface configuration mode. A packet arriving on the specified interface is subject to policy-based routing. This **ip policy route-map** command disables fast switching of all packets arriving on this interface.

To define the route map to be used for policy-based routing, use the **route-map** *map-tag* [**permit** | **deny**] [*sequence-number*] [**ordering-seq**] [*sequence-name*] global configuration command.

To define the criteria by which packets are examined to learn if they will be policy-based routed, use either the **match length** *minimum-length maximum-length* command or the **match ip address** {*access-list-number* | *access-list-name*} [*access-list-number* | *access-list-name*] command or both in route map configuration mode. No match clause in the route map indicates all packets.

To display the cache entries in the policy route cache, use the **show ip cache policy** command.


**Note**

Mediatrace will show statistics of incorrect interfaces with policy-based routing (PBR) if the PBR does not interact with CEF or Resource Reservation Protocol (RSVP). Hence configure PBR to interact with CEF or RSVP directly so that mediatrace collects statistics only on tunnel interfaces and not physical interfaces.

## Precedence Setting in the IP Header

The precedence setting in the IP header determines whether, during times of high traffic, the packets are treated with more or less precedence than other packets. By default, the Cisco software leaves this value untouched; the header remains with the precedence value that it had.

The precedence bits in the IP header can be set in the device when policy-based routing is enabled. When the packets containing those headers arrive at another device, the packets are ordered for transmission according to the precedence set, if the queueing feature is enabled. The device does not honor the precedence bits if queueing is not enabled; the packets are sent in FIFO order.

You can change the precedence setting, using either a number or name (the names came from RFC 791). You can enable other features that use the values in the **set ip precedence** route map configuration command to determine precedence. The table below lists the possible numbers and their corresponding name, from lowest to highest precedence.

**Table 1: IP Precedence Values**

Number	Name
0	routine
1	priority
2	immediate
3	flash
4	flash-override

Number	Name
5	critical
6	internet
7	network

The **set** commands can be used with each other. They are evaluated in the order shown in the previous table. A usable next hop implies an interface. Once the local device finds a next hop and a usable interface, it routes the packet.

# How to Configure Policy-Based Routing Default Next-Hop Routes

## Configuring Precedence for Policy-Based Routing Default Next-Hop Routes

Perform this task to configure the precedence of packets and specify where packets that pass the match criteria are output.



**Note** The **set ip next-hop** and **set ip default next-hop** commands are similar but have a different order of operation. Configuring the **set ip next-hop** command causes the system to first use policy routing and then use the routing table. Configuring the **set ip default next-hop** command causes the system to first use the routing table and then the policy-route-specified next hop.

### SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **route-map** *map-tag* [**permit** | **deny**] [*sequence-number*] [
4. **set ip precedence** {*number* | *name*}
5. **set ip next-hop** *ip-address* [*ip-address*]
6. **set interface** *type number* [...*type number*]
7. **set ip default next-hop** *ip-address* [*ip-address*]
8. **set default interface** *type number* [...*type number*]
9. **end**

### DETAILED STEPS

	Command or Action	Purpose
Step 1	<b>enable</b> <b>Example:</b> Device> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> <li>• Enter your password if prompted.</li> </ul>

	Command or Action	Purpose
<b>Step 2</b>	<b>configure terminal</b> <b>Example:</b> <pre>Device# configure terminal</pre>	Enters global configuration mode.
<b>Step 3</b>	<b>route-map map-tag [permit   deny] [sequence-number]</b> <b>Example:</b> <pre>Device(config)# route-map alpha permit ordering-seq</pre>	Configures a route map and specifies how the packets are to be distributed.
<b>Step 4</b>	<b>set ip precedence {number   name}</b> <b>Example:</b> <pre>Device(config-route-map)# set ip precedence 5</pre>	Sets the precedence value in the IP header. <b>Note</b> You can specify either a precedence number or a precedence name.
<b>Step 5</b>	<b>set ip next-hop ip-address [ip-address]</b> <b>Example:</b> <pre>Device(config-route-map)# set ip next-hop 192.0.2.1</pre>	Specifies the next hop for routing packets. <b>Note</b> The next hop must be an adjacent device.
<b>Step 6</b>	<b>set interface type number [...type number]</b> <b>Example:</b> <pre>Device(config-route-map)# set interface gigabitethernet 0/0/0</pre>	Specifies the output interface for the packet.
<b>Step 7</b>	<b>set ip default next-hop ip-address [ip-address]</b> <b>Example:</b> <pre>Device(config-route-map)# set ip default next-hop 172.16.6.6</pre>	Specifies the next hop for routing packets if there is no explicit route for this destination. <b>Note</b> Like the <b>set ip next-hop</b> command, the <b>set ip default next-hop</b> command must specify an adjacent device.
<b>Step 8</b>	<b>set default interface type number [...type number]</b> <b>Example:</b> <pre>Device(config-route-map)# set default interface serial 0/0/0</pre>	Specifies the output interface for the packet if there is no explicit route for the destination.
<b>Step 9</b>	<b>end</b> <b>Example:</b> <pre>Device(config-route-map)# end</pre>	Exits route-map configuration mode and returns to privileged EXEC mode.

# Configuration Examples for Policy-Based Routing Default Next-Hop Routes

## Example: Policy-Based Routing

The following example provides two sources with equal access to two different service providers. Packets that arrive on asynchronous interface 1/0/0 from the source 10.1.1.1 are sent to the device at 172.16.6.6 if the device has no explicit route for the destination of the packet. Packets that arrive from the source 172.17.2.2 are sent to the device at 192.168.7.7 if the device has no explicit route for the destination of the packet. All other packets for which the device has no explicit route to the destination are discarded.

```
Device(config)# access-list 1 permit ip 10.1.1.1
Device(config)# access-list 2 permit ip 172.17.2.2
Device(config)# interface async 1/0/0
Device(config-if)# ip policy route-map equal-access
Device(config-if)# exit
Device(config)# route-map equal-access permit 10
Device(config-route-map)# match ip address 1
Device(config-route-map)# set ip default next-hop 172.16.6.6
Device(config-route-map)# exit
Device(config)# route-map equal-access permit 20
Device(config-route-map)# match ip address 2
Device(config-route-map)# set ip default next-hop 192.168.7.7
Device(config-route-map)# exit
Device(config)# route-map equal-access permit 30
Device(config-route-map)# set default interface null 0
Device(config-route-map)# exit
```

## Additional References

### Related Documents

Related Topic	Document Title
IP routing protocol-independent commands	<a href="#">Cisco IOS IP Routing: Protocol-Independent Command Reference</a>

### Technical Assistance

Description	Link
The Cisco Support and Documentation website provides online resources to download documentation, software, and tools. Use these resources to install and configure the software and to troubleshoot and resolve technical issues with Cisco products and technologies. Access to most tools on the Cisco Support and Documentation website requires a Cisco.com user ID and password.	<a href="http://www.cisco.com/cisco/web/support/index.html">http://www.cisco.com/cisco/web/support/index.html</a>

# Feature Information for Policy-Based Routing Default Next-Hop Routes

The following table provides release information about the feature or features described in this module. This table lists only the software release that introduced support for a given feature in a given software release train. Unless noted otherwise, subsequent releases of that software release train also support that feature.

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**Table 2: Feature Information for Policy-Based Routing Default Next-Hop Routes**

Feature Name	Releases	Feature Information
Policy-Based Routing Default Next-Hop Routes	12.1(11)E Cisco IOS XE Release 2.2	<p>The Policy-Based Routing Default Next-Hop Route feature introduces the ability for packets that are forwarded as a result of the <b>set ip default next-hop</b> command to be switched at the hardware level. In prior releases, the packets to be forwarded that were generated from the route map for policy-based routing were switched at the software level.</p> <p>The following command was introduced or modified: <b>set ip default next-hop</b>.</p>