



Policy-Based Routing

The Policy-Based Routing feature is a process whereby a device puts packets through a route map before routing the packets. The route map determines which packets are routed next to which device. Policy-based routing is a more flexible mechanism for routing packets than destination routing.

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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 at the end of this module.

Use Cisco Feature Navigator to find information about platform support and Cisco software image support. To access Cisco Feature Navigator, go to www.cisco.com/go/cfn. An account on Cisco.com is not required.

Prerequisites for Policy-Based Routing

For Policy-Based Routing, IPBase is a minimum licensing requirement.

Information About Policy-Based Routing

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 except when its destination IP address is the same as the IP address of the device's interface. 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

Number	Name
2	immediate
3	flash
4	flash-override
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.

Local Policy Routing

Packets that are generated by the device are not normally policy-routed. To enable local policy routing for such packets, indicate which route map the device should use by using the **ip local policy route-map map-tag** global configuration command. All packets originating on the device will then be subject to local policy routing.



Note

Unlike UDP or other IP traffic, TCP traffic between a Cisco IOS or Cisco IOS-XE device and a remote host cannot be controlled using a local IP policy, if the Cisco device does not have an entry for the remote host IP in the Routing Information Base (RIB) (routing table) and Forwarding Information Base (FIB) (for Cisco Express Forwarding). It is not necessary that the RIB or FIB entry should be the same path as the one being set by PBR. In the absence of this entry, TCP does not detect a valid path to the destination and TCP traffic fails. However, UDP or ICMP traffic continues to be routed as per the local policy,

Use the **show ip local policy** command to display the route map used for local policy routing, if one exists.

How to Configure Policy-Based Routing

Configuring Policy-Based Routing

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface type number**
4. **ip policy route-map map-tag**
5. **exit**
6. **route-map map-tag [permit | deny] [sequence-number] [**

7. Enter one or both of the following commands:

- **match length**
- **match ip address**

8. **set ip next-hop** {*ip-address*[...*ip-address*] | **dynamic dhcp** | **encapsulate l3vpn** *profile-name* | **peer-address** | **recursive** [**global** | **vrf** *vrf-name*] *ip-address* | **verify-availability** [*ip-address sequence track track-object-number*]}

9. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	enable Example: <pre>Device> enable</pre>	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	configure terminal Example: <pre>Device# configure terminal</pre>	Enters global configuration mode.
Step 3	interface <i>type number</i> Example: <pre>Device(config)# interface gigabitethernet 1/0/0</pre>	Configures an interface type and enters interface configuration mode.
Step 4	ip policy route-map <i>map-tag</i> Example: <pre>Device(config-if)# ip policy route-map equal-access</pre>	Identifies a route map to use for policy routing on an interface.
Step 5	exit Example: <pre>Device(config-if)# exit</pre>	Returns to global configuration mode.
Step 6	route-map <i>map-tag</i> [permit deny] [<i>sequence-number</i>] [Example: <pre>Device(config)# route-map alpha permit ordering-seq</pre>	Configures a route map and specifies how the packets are to be distributed. . • <i>map-tag</i>—A meaningful name for the route map. • permit—(Optional) If the match criteria are met for this route map, and the permit keyword is specified, the route is redistributed as controlled by the set actions. In the case of policy routing, the packet is policy routed. If the match criteria are not met, and the permit keyword is specified, the next route map with the same map tag is tested. If a route passes none of

	Command or Action	Purpose
		the match criteria for the set of route maps sharing the same name, it is not redistributed by that set. • deny—(Optional) If the match criteria are met for the route map and the deny keyword is specified, the route is not redistributed. In the case of policy routing, the packet is not policy routed, and no further route maps sharing the same map tag name will be examined. If the packet is not policy routed, the normal forwarding algorithm is used. • <i>sequence-number</i>—(Optional) Number that indicates the position a new route map will have in the list of route maps already configured with the same name. If used with the no form of this command, the position of the route map configure terminal should be deleted.
Step 7	Enter one or both of the following commands: • match length • match ip address Example: <pre>Device(config-route-map)# match ip address 1</pre>	Define the criteria by which packets are examined to learn if they will be policy-based routed.
Step 8	set ip next-hop {<i>ip-address</i>[...<i>ip-address</i>] dynamic dhcp encapsulate l3vpn <i>profile-name</i> peer-address recursive [global vrf <i>vrf-name</i>] <i>ip-address</i> verify-availability [<i>ip-address</i> <i>sequence</i> track <i>track-object-number</i>]} Example: <pre>Device(config-route-map)# set ip next-hop 172.16.6.6</pre>	Specifies where to output packets that pass a match clause of a route map for policy routing.
Step 9	end Example: <pre>Device(config-route-map)# end</pre>	Exits route-map configuration mode and returns to privileged EXEC mode.

Configuration Examples for Policy-Based Routing

Additional References

Related Documents

Related Topic	Document Title
Cisco IOS commands	Cisco IOS Master Command List, All Releases
IP routing protocol-independent commands	Cisco IOS IP Routing: Protocol-Independent Command Reference

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.	http://www.cisco.com/cisco/web/support/index.html

Feature Information for Policy-Based Routing

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

Feature Name	Releases	Feature Information
Policy-Based Routing		The Policy-Based Routing feature is a process whereby a device puts packets through a route map before routing the packets. The route map determines which packets are routed next to which device. Policy-Based Routing introduces a more flexible mechanism for routing packets than destination routing. The following command was introduced or modified: ip policy route-map.

