

VYATTA, INC.

| **Vyatta System**

# Basic Routing

## REFERENCE GUIDE

Forwarding and Routing  
Static Routes



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# Quick Reference to Commands

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Use this section to help you quickly locate a command.

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# Quick List of Examples

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# Preface

This guide describes basic routing and forwarding commands, such as commands for showing forwarding and routing tables in various ways. It also describes the available commands and provides configuration examples for static routes.

This preface provides information about using this guide. The following topics are covered:

- Intended Audience
- Organization of This Guide
- Document Conventions
- Vyatta Publications



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## Intended Audience

This guide is intended for experienced system and network administrators. Depending on the functionality to be used, readers should have specific knowledge in the following areas:

- Networking and data communications
- TCP/IP protocols
- General router configuration
- Routing protocols
- Network administration
- Network security

## Organization of This Guide

This guide has the following aid to help you find the information you are looking for:

- **Quick Reference to Commands**

Use this section to help you quickly locate a command.

- **Quick List of Examples**

Use this list to help you locate examples you'd like to try or look at.

This guide has the following chapters:

Chapter	Description	Page
Chapter 1: Forwarding and Routing	This chapter describes commands for forwarding and basic routing.	1
Chapter 2: Static Routes	This chapter explains how to set static routes using the Vyatta system.	19
Glossary of Acronyms		33

## Document Conventions

This guide contains advisory paragraphs and uses typographic conventions.

## Advisory Paragraphs

This guide uses the following advisory paragraphs:

**Warnings** alert you to situations that may pose a threat to personal safety, as in the following example:



**WARNING** *Switch off power at the main breaker before attempting to connect the remote cable to the service power at the utility box.*

**Cautions** alert you to situations that might cause harm to your system or damage to equipment, or that may affect service, as in the following example:



**CAUTION** *Restarting a running system will interrupt service.*

**Notes** provide information you might need to avoid problems or configuration errors:

**NOTE** *You must create and configure network interfaces before enabling them for routing protocols.*

## Typographic Conventions

This document uses the following typographic conventions:

Monospace	Examples, command-line output, and representations of configuration nodes.
<b>bold Monospace</b>	Your input: something you type at a command line.
<b>bold</b>	Commands, keywords, and file names, when mentioned inline. Objects in the user interface, such as tabs, buttons, screens, and panes.
<i>italics</i>	An argument or variable where you supply a value.
<key>	A key on your keyboard, such as <Enter>. Combinations of keys are joined by plus signs (“+”), as in <Ctrl>+c.
[ <i>arg1</i>   <i>arg2</i> ]	Enumerated options for completing a syntax. An example is [enable   disable].
<i>num1–numN</i>	A inclusive range of numbers. An example is 1–65535, which means 1 through 65535, inclusive.
<i>arg1..argN</i>	A range of enumerated values. An example is eth0..eth3, which means eth0, eth1, eth2, or eth3.
<i>arg</i> [ <i>arg...</i> ] <i>arg</i> [, <i>arg...</i> ]	A value that can optionally represent a list of elements (a space-separated list in the first case and a comma-separated list in the second case).

---

## Vyatta Publications

More information about the Vyatta system is available in the Vyatta technical library, and on [www.vyatta.com](http://www.vyatta.com) and [www.vyatta.org](http://www.vyatta.org).

Full product documentation is provided in the Vyatta technical library. To see what documentation is available for your release, see the *Guide to Vyatta Documentation*. This guide is posted with every release of Vyatta software and provides a great starting point for finding the information you need.

# Chapter 1: Forwarding and Routing

This chapter describes commands for forwarding and basic routing.

This chapter presents the following topics:

- Forwarding and Routing Commands

# Forwarding and Routing Commands

This chapter contains the following commands.

## Configuration Commands

None

## Operational Commands

clear ip prefix-list	Clears prefix list statistics or status.
clear ip route cache	Flushes the kernel route cache.
show ip forwarding	Displays IP forwarding status.
show ip route	Displays routes stored in the RIB and FIB.
show ip route <ipv4net> longer-prefixes	Displays prefixes longer than a specified prefix.
show ip route cache	Displays the kernel route cache.
show ip route connected	Displays directly connected routes.
show ip route forward	Displays routes stored in the FIB.
show ip route static	Displays static routes.
show ip route kernel	Displays kernel routes.
show ip route summary	Displays routes summary.
show ip route supernets-only	Displays supernet routes.
show table	Displays the system's routing table.

# clear ip prefix-list

Clears prefix list statistics or status.

## Syntax

```
clear ip prefix-list [list-name [ipv4net]]
```

## Command Mode

Operational mode.

## Parameters

---

<i>list-name</i>	Optional. Clears statistics for the specified prefix list.
<i>ipv4net</i>	Optional. Clears statistics for the specified network.

---

## Default

Statistics for all prefix-lists are cleared.

## Usage Guidelines

Use this command to clear prefix list statistics or status.

---

# clear ip route cache

Flushes the kernel route cache.

## Syntax

```
clear ip route cache [ipv4net]
```

## Command Mode

Operational mode.

## Parameters

---

<i>ipv4net</i>	Optional. Flushes the specified route from the kernel route cache.
----------------	--

---

## Default

Flushes the entire route cache.

## Usage Guidelines

Use this command to flush the kernel route cache or a flush a specific route from the cache.

---

---

# show ip forwarding

Displays IP forwarding status.

## Syntax

```
show ip forwarding
```

## Command Mode

Operational mode.

## Parameters

None.

## Default

None.

## Usage Guidelines

Use this command to display the current IP forwarding status.

## Examples

Example 1-1 shows how to display the status of IP forwarding.

Example 1-1 Displaying IP forwarding status

```
vyatta@vyatta:~$ show ip forwarding  
IP forwarding is on  
vyatta@vyatta:~$
```



---

# show ip route

Displays routes stored in the RIB and FIB.

## Syntax

```
show ip route [ipv4 / ipv4net]
```

## Command Mode

Operational mode.

## Parameters

<i>ipv4</i>	Optional. Displays routing information for the specified address.
<i>ipv4net</i>	Optional. Displays routing information for the specified prefix.

## Default

Lists all routes in the RIB and FIB.

## Usage Guidelines

Use this command to display active prefixes stored in the Routing Information Base (RIB), as well as those stored in the Forwarding Information Base (FIB).

The routes shown in the FIB can also be seen using the **show ip route forward** command (see page 12).

## Examples

Example 1-2 shows how to display routes in the RIB and FIB

Example 1-2 Displaying routes in the RIB and FIB

```
vyatta@vyatta:~$ show ip route
Codes: K - kernel route, C - connected, S - static, R - RIP, O -
OSPF,
       I - ISIS, B - BGP, > - selected route, * - FIB route

S>* 0.0.0.0/0 [1/0] via 10.1.0.1, eth0
O 10.1.0.0/24 [110/10] is directly connected, eth0, 05:35:15
C>* 10.1.0.0/24 is directly connected, eth0
O>* 10.192.32.0/24 [110/20] via 10.1.0.45, eth0, 05:35:15
O>* 10.192.128.0/24 [110/11] via 10.1.0.66, eth0, 05:35:15
O>* 10.192.128.1/32 [110/11] via 10.1.0.66, eth0, 05:35:15
O>* 10.192.129.0/24 [110/11] via 10.1.0.66, eth0, 05:35:15
```

---

---

```
O>* 10.192.130.0/24 [110/11] via 10.1.0.66, eth0, 05:35:15
O>* 10.192.131.0/24 [110/11] via 10.1.0.66, eth0, 05:35:15
C>* 127.0.0.0/8 is directly connected, lo
O>* 172.16.0.0/24 [110/11] via 10.1.0.4, eth0, 05:35:15
O>* 172.16.1.0/24 [110/11] via 10.1.0.4, eth0, 05:35:15
O>* 172.16.2.0/24 [110/11] via 10.1.0.4, eth0, 05:35:15
O>* 172.16.3.0/24 [110/11] via 10.1.0.4, eth0, 05:35:15
O>* 172.16.4.0/24 [110/11] via 10.1.0.4, eth0, 05:35:15
O>* 172.16.5.0/24 [110/11] via 10.1.0.4, eth0, 05:35:15
O>* 172.16.6.0/24 [110/11] via 10.1.0.4, eth0, 05:35:15
O>* 172.16.7.0/24 [110/11] via 10.1.0.4, eth0, 05:35:15
O>* 172.16.8.0/24 [110/11] via 10.1.0.4, eth0, 05:35:15
O>* 172.16.9.0/24 [110/11] via 10.1.0.4, eth0, 05:35:15
C>* 172.16.234.0/25 is directly connected, eth1
S>* 192.94.202.0/24 [1/0] via 172.16.234.27, eth1
vyatta@vyatta:~$
```

Example 1-3 shows information how to display information for the route to address 10.192.128.1.

#### Example 1-3 Displaying routing information about a specific address

```
vyatta@vyatta:~$ show ip route 10.192.128.1
Routing entry for 10.192.128.1/32
  Known via "ospf", distance 110, metric 11, best
  Last update 09:47:07 ago
  * 10.1.0.66, via eth0
vyatta@vyatta:~$
```

---

---

## show ip route <ipv4net> longer-prefixes

Displays prefixes longer than a specified prefix.

### Syntax

```
show ip route ipv4net longer-prefixes
```

### Command Mode

Operational mode.

### Parameters

---

<i>ipv4net</i>	Mandatory. Displays all prefixes longer than the specified prefix.
----------------	--

---

### Default

None.

### Usage Guidelines

Use this command to display all prefixes in the Routing Information Base (RIB) that are longer than a given IP address or prefix.

### Examples

Example 1-4 shows how to list prefixes longer than the prefix 10.192.128.0/24.

Example 1-4 Displaying routes with longer prefixes

```
vyatta@vyatta:~$ show ip route 10.192.128.0/24 longer-prefixes
Codes: K - kernel route, C - connected, S - static, R - RIP, O -
OSPF,
       I - ISIS, B - BGP, > - selected route, * - FIB route

O>* 10.192.128.0/24 [110/11] via 10.1.0.66, eth0, 09:36:20
O>* 10.192.128.1/32 [110/11] via 10.1.0.66, eth0, 09:36:20
vyatta@vyatta:~$
```

---

# show ip route cache

Displays the kernel route cache.

## Syntax

```
show ip route cache [ipv4net]
```

## Command Mode

Operational mode.

## Parameters

---

<i>ipv4net</i>	Optional. Displays kernel route cache information for the specified route.
----------------	--

---

## Default

Lists routes in the kernel route cache.

## Usage Guidelines

Use this command to display information about routes stored in the kernel route cache. The route cache contains all paths currently in use by the cache. Multiple equal-cost paths are necessary before equal-cost-multi-path (ECMP) routing can be performed.

## Examples

Example 1-5 shows how to list routes in the kernel route cache.

### Example 1-5 Listing routes in the kernel route cache

```
vyatta@vyatta:~$ show ip route cache
local 10.1.0.62 from 10.1.0.1 dev lo src 10.1.0.62
  cache <local,src-direct> users 1 age 42sec iif eth0
multicast 224.0.0.5 from 10.1.0.45 dev lo src 10.1.0.62
  cache <local,mc> users 1 used 8 age 5sec iif eth0
local 10.1.0.62 from 69.59.150.131 dev lo src 10.1.0.62
  cache <local> users 1 used 3 age 47sec iif eth0
10.1.0.1 from 10.1.0.62 dev eth0
  cache users 1 age 42sec mtu 1500 advmss 1460 hoplimit 64
10.0.0.30 from 10.1.0.62 tos lowdelay via 10.1.0.1 dev eth0
  cache users 2 age 0sec mtu 1500 advmss 1460 hoplimit 64
multicast 224.0.0.5 from 10.1.0.56 dev lo src 10.1.0.62
  cache <local,mc> users 1 used 8 age 8sec iif eth0
multicast 224.0.0.5 from 10.1.0.66 dev lo src 10.1.0.62
```

---

---

```
cache <local,mc> users 1 used 8 age 0sec iif eth0
multicast 224.0.0.6 dev eth0 src 10.1.0.62
cache <mc> users 1 age 21sec mtu 1500 advmss 1460 hoplimit 64
multicast 224.0.0.5 from 10.1.0.4 dev lo src 10.1.0.62
cache <local,mc> users 1 used 9 age 1sec iif eth0
69.59.150.131 via 10.1.0.1 dev eth0 src 10.1.0.62
cache users 1 age 47sec mtu 1500 advmss 1460 hoplimit 64
multicast 224.0.0.5 dev eth0 src 10.1.0.62
cache <local,mc> users 1 used 8 age 5sec mtu 1500 advmss
1460 hoplimit 64
69.59.150.131 from 10.1.0.62 via 10.1.0.1 dev eth0
cache users 1 used 1 age 47sec mtu 1500 advmss 1460 hoplimit
64
local 10.1.0.62 from 10.0.0.30 tos lowdelay dev lo src 10.1.0.62
cache <local> users 1 used 1 age 0sec iif eth0
vyatta@vyatta:~$
```

Example 1-6 shows how to display information about route 10.1.0.62 in the kernel route cache.

#### Example 1-6 Displaying information about a route in the kernel route cache

```
vyatta@vyatta:~$ show ip route cache 10.1.0.62
local 10.1.0.62 from 10.1.0.1 dev lo src 10.1.0.62
cache <local,src-direct> users 1 used 3 age 9sec iif eth0
local 10.1.0.62 from 69.59.150.131 dev lo src 10.1.0.62
cache <local> users 1 used 7 age 102sec iif eth0
local 10.1.0.62 from 10.0.0.30 tos lowdelay dev lo src 10.1.0.62
cache <local> users 1 used 33 iif eth0
vyatta@vyatta:~$
```

---

---

# show ip route connected

Displays directly connected routes.

## Syntax

```
show ip route connected
```

## Command Mode

Operational mode.

## Parameters

None.

## Default

None.

## Usage Guidelines

Use this command to display routes directly connected to the local system.

## Examples

Example 1-7 shows how to list directly connected routes.

### Example 1-7 Displaying connected routes

```
vyatta@vyatta:~$ show ip route connected
Codes: K - kernel route, C - connected, S - static, R - RIP, O -
OSPF,
        I - ISIS, B - BGP, > - selected route, * - FIB route

C>* 10.1.0.0/24 is directly connected, eth0
C>* 127.0.0.0/8 is directly connected, lo
C>* 172.16.234.0/25 is directly connected, eth1
vyatta@vyatta:~$
```

---

# show ip route forward

Displays routes stored in the FIB.

## Syntax

```
show ip route forward [ipv4net]
```

## Command Mode

Operational mode.

## Parameters

---

<i>ipv4net</i>	Optional. Displays information from the kernel forwarding table for the specified route.
----------------	--

---

## Default

Lists routes in the FIB.

## Usage Guidelines

Use this command to display the FIB.

The FIB contains multiple equal-cost paths if existed. Multiple equal-cost paths are necessary before equal-cost multi-path (ECMP) routing or WAN load balancing can be performed.

## Examples

Example 1-8 shows how to display routes recorded in the FIB.

### Example 1-8 Displaying routes in the FIB

```
vyatta@vyatta:~$ show ip route forward
default via 10.1.0.1 dev eth0 proto zebra
10.1.0.0/24 dev eth0 proto kernel scope link src 10.1.0.62
10.192.32.0/24 via 10.1.0.45 dev eth0 proto zebra metric 20
10.192.128.0/24 via 10.1.0.66 dev eth0 proto zebra metric 11
10.192.128.1 via 10.1.0.66 dev eth0 proto zebra metric 11
10.192.129.0/24 via 10.1.0.66 dev eth0 proto zebra metric 11
10.192.130.0/24 via 10.1.0.66 dev eth0 proto zebra metric 11
10.192.131.0/24 via 10.1.0.66 dev eth0 proto zebra metric 11
172.16.0.0/24 via 10.1.0.4 dev eth0 proto zebra metric 11
172.16.1.0/24 via 10.1.0.4 dev eth0 proto zebra metric 11
172.16.2.0/24 via 10.1.0.4 dev eth0 proto zebra metric 11
172.16.3.0/24 via 10.1.0.4 dev eth0 proto zebra metric 11
```

---

---

```
172.16.4.0/24 via 10.1.0.4 dev eth0 proto zebra metric 11
172.16.5.0/24 via 10.1.0.4 dev eth0 proto zebra metric 11
172.16.6.0/24 via 10.1.0.4 dev eth0 proto zebra metric 11
172.16.7.0/24 via 10.1.0.4 dev eth0 proto zebra metric 11
172.16.8.0/24 via 10.1.0.4 dev eth0 proto zebra metric 11
172.16.9.0/24 via 10.1.0.4 dev eth0 proto zebra metric 11
172.16.234.0/25 dev eth1 proto kernel scope link src
172.16.234.23
192.94.202.0/24 via 172.16.234.27 dev eth1 proto zebra
vyatta@vyatta:~$
```

Example 1-9 shows how to display information from the FIB about route 10.1.0.0/24.

**Example 1-9** Displaying information about a route in the FIB

```
vyatta@vyatta:~$ show ip route forward 10.1.0.0/24
10.1.0.0/24 dev eth0 proto kernel scope link src 10.1.0.62
vyatta@vyatta:~$
```



---

# show ip route kernel

Displays kernel routes.

## Syntax

```
show ip route kernel
```

## Command Mode

Operational mode.

## Parameters

None.

## Default

None.

## Usage Guidelines

Use this command to display kernel routes. Kernel routes are routes that have been added through means other than by using the Vyatta CLI; for example by using the operating system route command, as in the following:

```
route add -net 10.172.24.0 netmask 255.255.255.0 gw 10.1.0.1
```

## Examples

Example 1-10 shows how to display kernel routes.

### Example 1-10 Displaying kernel routes

```
vyatta@vyatta:~$ show ip route kernel
Codes: K - kernel route, C - connected, S - static, R - RIP, O -
OSPF,
        I - ISIS, B - BGP, > - selected route, * - FIB route

K>* 10.172.24.0/24 via 10.1.0.1, eth0
vyatta@vyatta:~$
```

---

# show ip route static

Displays static routes.

## Syntax

```
show ip route static
```

## Command Mode

Operational mode.

## Parameters

None.

## Default

None.

## Usage Guidelines

Use this command to display static routes in the Routing Information Base (RIB).

## Examples

Example 1-11 shows how to list static routes.

### Example 1-11 Displaying static routes

```
vyatta@vyatta:~$ show ip route static
Codes: K - kernel route, C - connected, S - static, R - RIP, O -
OSPF,
        I - ISIS, B - BGP, > - selected route, * - FIB route

S>* 0.0.0.0/0 [1/0] via 10.1.0.1, eth0
S>* 192.94.202.0/24 [1/0] via 172.16.234.27, eth1
vyatta@vyatta:~$
```

---

---

# show ip route summary

Displays routes summary.

## Syntax

```
show ip route summary
```

## Command Mode

Operational mode.

## Parameters

None.

## Default

None.

## Usage Guidelines

Use this command to display a summary of the various routes by route source.

## Examples

Example 1-12 shows how to display a summary of routes.

Example 1-12 Displaying a summary of routes

```
vyatta@vyatta:~$ show ip route summary
Route Source      Routes      FIB
connected         4           4
static            2           2
ospf              1           0
ebgp              0           0
ibgp              289016     289011
-----
Totals            289023     289017
[edit]
vyatta@vyatta:~$
```

---

# show ip route supernets-only

Displays supernet routes.

## Syntax

```
show ip route supernets-only
```

## Command Mode

Operational mode.

## Parameters

None.

## Default

None.

## Usage Guidelines

Use this command to display supernet routes.

Supernet routes are routes that have a subnet mask that is less specific than the natural classful mask.

## Examples

Example 1-13 shows how to list supernet routes.

### Example 1-13 Displaying supernet routes

```
vyatta@vyatta:~$ show ip route supernets-only
Codes: K - kernel route, C - connected, S - static, R - RIP, O -
OSPF,
        I - ISIS, B - BGP, > - selected route, * - FIB route

S>* 0.0.0.0/0 [1/0] via 10.1.0.1, eth0
vyatta@vyatta:~$
```

# show table

Displays the system's routing table.

## Syntax

```
show table
```

## Command Mode

Operational mode.

## Parameters

None.

## Default

None.

## Usage Guidelines

Use this command to display the system's routing table.

## Examples

Example 1-14 shows how to display the routing table.

Example 1-14 Displaying the routing table

```
vyatta@vyatta:~$ show table  
table 0  
vyatta@vyatta:~$
```

## Chapter 2: Static Routes

This chapter explains how to set static routes using the Vyatta system.

This chapter presents the following topics:

- Static Route Configuration
- Static Route Commands

# Static Route Configuration

This section presents the following topics:

- Static Routes Overview
- Configuring Static Routes
- Floating Static Routes

## Static Routes Overview

A static route is a manually configured route, which, in general, cannot be updated dynamically from information the Vyatta system learns about the network topology. However, if a link fails, the router will remove routes, including static routes, from the Routing Information Base (RIB) that used this interface to reach the next hop.

In general, static routes should only be used for very simple network topologies, or to override the behavior of a dynamic routing protocol for a small number of routes.

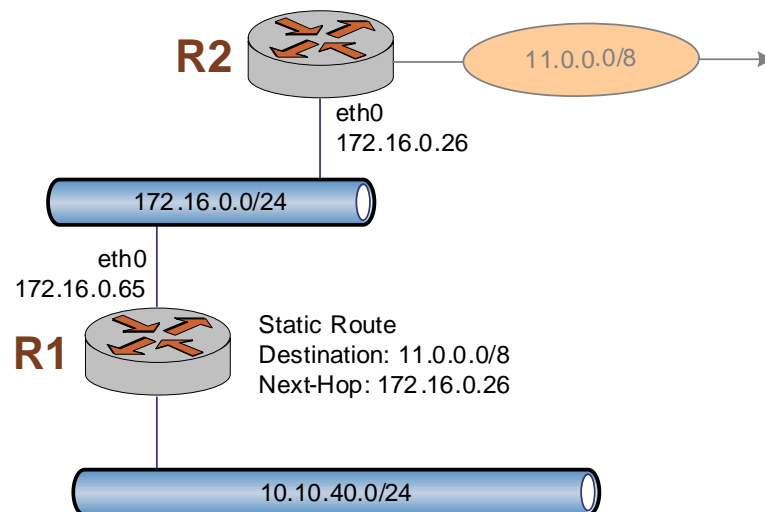
The collection of all routes the router has learned from its configuration or from its dynamic routing protocols is stored in its Routing Information Base (RIB).

Unicast routes are directly used to determine the forwarding table used for unicast packet forwarding.

## Configuring Static Routes

In this example, a sample configurations are presented for basic static routes. When you are finished, the system will be configured as shown in Figure 2-1. In this example, a static route is created that says, in effect, “any packets destined for the 11.0.0.0/8 network should be forwarded to 172.16.0.26”.

Figure 2-1 Static routes



This section includes the following examples:

- Example 2-1 Creating a static route

Example 2-1 creates a static route to network 11.0.0.0/8 directed towards 172.16.0.26.

To create a static route, perform the following steps in configuration mode:

### Example 2-1 Creating a static route

Step	Command
Create a static route to R2.	<pre>vyatta@R1# set protocols static route 11.0.0.0/8 next-hop 172.16.0.26 [edit]</pre>
Commit the configuration.	<pre>vyatta@R1# commit [edit]</pre>



## Floating Static Routes

Usually, static routes have a relatively short administrative distance—typically 1, and usually shorter than the administrative distances for dynamic (learned) routes. A “floating” static route is a static route with an administrative distance greater than that for dynamic routes.

You can configure a static route to be a floating route by setting the administrative distance higher than the distance applied to the routes in your dynamic routing protocol. This renders the static route less desirable than a dynamic route. At the same time, if the dynamic route is lost, the static route is available to take over traffic, which can be forwarded through the static route as an alternate path.

## Monitoring Static Route Information

This section presents the following topic:

- Static Route Operational Commands
- Showing Static Routes in the Routing Table

## Static Route Operational Commands

You can use the following operational command to monitor static routes.

Command	Description
<code>show ip route</code>	Displays information about routes stored in the routing table.

This section presents the following examples:

- Example 2-2 Showing static routes in the routing table

## Showing Static Routes in the Routing Table

To display route information, use the **show ip route** command. To show just static routes, use the **show ip route static** filter, as shown in Example 2-2.

### Example 2-2 Showing static routes in the routing table

```
vyatta@R1:~$ show ip route static
Codes: K - kernel route, C - connected, S - static, R - RIP, O - OSPF,
       I - ISIS, B - BGP, > - selected route, * - FIB route
```

```
S>* 0.0.0.0/0 [1/0] via 10.1.0.1, eth0
S>* 10.7.0.48/28 [1/0] via 10.6.0.57, eth1
vyatta@R1:~$
```

# Static Route Commands

This chapter contains the following commands.

Configuration Commands	
<code>protocols static interface-route &lt;subnet&gt; blackhole</code>	Allows you to configure a “black-hole” route for an interface-based static route.
<code>protocols static interface-route &lt;subnet&gt; next-hop-interface &lt;ethx&gt;</code>	Allows you to configure the next-hop interface for an interface-based static route.
<code>protocols static route &lt;subnet&gt; blackhole</code>	Allows you to configure a “black-hole” static route.
<code>protocols static route &lt;subnet&gt; next-hop &lt;address&gt;</code>	Allows you to configure the next hop for a static route.
Operational Commands	
<code>show ip route static</code>	Displays static routes. <i>See page 15.</i>

## protocols static interface-route <subnet> blackhole

Allows you to configure a “black-hole” route for an interface-based static route.

### Syntax

**set protocols static interface-route** *subnet* **blackhole** [**distance** *distance*]

**delete protocols static interface-route** *subnet* **blackhole** [**distance**]

**show protocols static interface-route** *subnet* **blackhole** [**distance**]

### Command Mode

Configuration mode.

### Configuration Statement

```
protocols {
  static {
    interface-route ipv4net {
      blackhole {
        distance: 1-255
      }
    }
  }
}
```

### Parameters

---

*subnet* Mandatory. Multi-node. Defines an interface-based static route. The format is a destination subnet of the form *address/prefix*.

You can define multiple interface-based routes by creating multiple **interface-route** configuration nodes.

---

*distance* Optional. Defines the black-hole distance for this route. The range is 1 to 255. The default is 1.

---

### Default

None.

### Usage Guidelines

Use this command to configure interface-based “black-hole” static routes on the router. A black-hole route is a route for which the system silently discards packets that are matched.

Use the **set** form of this command to set a black-hole route.

Use the **delete** form of this command to remove a black-hole route.

Use the **show** form of this command to view black-hole route configuration.

## protocols static interface-route <subnet> next-hop-interface <ethx>

Allows you to configure the next-hop interface for an interface-based static route.

### Syntax

**set protocols static interface-route** *subnet* **next-hop-interface** *ethx* [**distance** *distance*]

**delete protocols static interface-route** *subnet* **next-hop-interface** *ethx* [**distance**]

**show protocols static interface-route** *subnet* **next-hop-interface** *ethx* [**distance**]

### Command Mode

Configuration mode.

### Configuration Statement

```
protocols {
  static {
    interface-route ipv4net {
      next-hop-interface eth0..eth23 {
        distance 1-255
      }
    }
  }
}
```

### Parameters

<i>subnet</i>	Mandatory. Multi-node. Defines an interface-based static route. The format is a destination subnet of the form <i>address/prefix</i> .  You can define multiple interface-based routes by creating multiple <b>interface-route</b> configuration nodes.
<i>ethx</i>	Mandatory. The next-hop Ethernet interface.
<i>distance</i>	Optional. Sets the next-hop distance for this route. Routes with a smaller distance are selected before those with a larger distance. The range is 1 to 255. The default is 1.

### Default

None.

## Usage Guidelines

Use this command to configure interface-based static routes on the router.

Use the **set** form of this command to specify the next-hop interface for the route.

Use the **delete** form of this command to remove the next-hop interface.

Use the **show** form of this command to view the next-hop interface for the route.

## protocols static route <subnet> blackhole

Allows you to configure a “black-hole” static route.

### Syntax

```
set protocols static route subnet blackhole [distance distance]  
delete protocols static route subnet blackhole [distance]  
show protocols static route subnet blackhole [distance]
```

### Command Mode

Configuration mode.

### Configuration Statement

```
protocols {  
  static {  
    route ipv4net {  
      blackhole {  
        distance 1-255  
      }  
    }  
  }  
}
```

### Parameters

---

<i>subnet</i>	Mandatory. Multi-node. Defines a static route. The format is a destination subnet of the form <i>address/prefix</i> .  You can define multiple static routes by creating multiple <b>route</b> configuration nodes.
<i>distance</i>	Optional. Defines the black-hole distance for this route. Routes with a smaller distance are selected before those with a larger distance. The range is 1 to 255. The default is 1.

---

### Default

None.



## Usage Guidelines

Use this command to configure a “black-hole” static route on the router. A black-hole route is a route for which the system silently discards packets that are matched.

Use the **set** form of this command to set a black-hole route.

Use the **delete** form of this command to remove a black-hole route.

Use the **show** form of this command to view black-hole route configuration.

## protocols static route <subnet> next-hop <address>

Allows you to configure the next hop for a static route.

### Syntax

**set protocols static route** *subnet* **next-hop** *address* [**distance** *distance*]

**delete protocols static route** *subnet* **next-hop** *address* [**distance**]

**show protocols static route** *subnet* **next-hop** *address* [**distance**]

### Command Mode

Configuration mode.

### Configuration Statement

```
protocols {
  static {
    route ipv4net {
      next-hop ipv4 {
        distance 1-255
      }
    }
  }
}
```

### Parameters

<i>subnet</i>	Mandatory. Multi-node. Defines a static route. The format is a destination subnet of the form <i>address/prefix</i> .  You can define multiple static routes by creating multiple <b>route</b> configuration nodes.
<i>address</i>	Mandatory. The address of the next-hop router.
<i>distance</i>	Optional. Defines the next-hop distance for this route. Routes with a smaller distance are selected before those with a larger distance. The range is 1 to 255. The default is 1.

### Default

None.

## Usage Guidelines

Use this command to configure static routes on the router.

Use the **set** form of this command to specify the next hop for the route.

Use the **delete** form of this command to remove the static route next hop.

Use the **show** form of this command to view static route next-hop configuration.

# Glossary of Acronyms

ACL	access control list
ADSL	Asymmetric Digital Subscriber Line
API	Application Programming Interface
AS	autonomous system
ARP	Address Resolution Protocol
BGP	Border Gateway Protocol
BIOS	Basic Input Output System
BPDU	Bridge Protocol Data Unit
CA	certificate authority
CHAP	Challenge Handshake Authentication Protocol
CLI	command-line interface
DDNS	dynamic DNS
DHCP	Dynamic Host Configuration Protocol
DLCI	data-link connection identifier
DMI	desktop management interface
DMZ	demilitarized zone
DN	distinguished name
DNS	Domain Name System
DSCP	Differentiated Services Code Point

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DSL	Digital Subscriber Line
eBGP	external BGP
EGP	Exterior Gateway Protocol
ECMP	equal-cost multipath
ESP	Encapsulating Security Payload
FIB	Forwarding Information Base
FTP	File Transfer Protocol
GRE	Generic Routing Encapsulation
HDLC	High-Level Data Link Control
I/O	Input/Output
ICMP	Internet Control Message Protocol
IDS	Intrusion Detection System
IEEE	Institute of Electrical and Electronics Engineers
IGP	Interior Gateway Protocol
IPS	Intrusion Protection System
IKE	Internet Key Exchange
IP	Internet Protocol
IPOA	IP over ATM
IPsec	IP security
IPv4	IP Version 4
IPv6	IP Version 6
ISP	Internet Service Provider
L2TP	Layer 2 Tunneling Protocol
LACP	Link Aggregation Control Protocol
LAN	local area network
LDAP	Lightweight Directory Access Protocol
MAC	medium access control

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MIB	Management Information Base
MLPPP	multilink PPP
MRRU	maximum received reconstructed unit
MTU	maximum transmission unit
NAT	Network Address Translation
ND	Neighbor Discovery
NIC	network interface card
NTP	Network Time Protocol
OSPF	Open Shortest Path First
OSPFv2	OSPF Version 2
OSPFv3	OSPF Version 3
PAM	Pluggable Authentication Module
PAP	Password Authentication Protocol
PAT	Port Address Translation
PCI	peripheral component interconnect
PKI	Public Key Infrastructure
PPP	Point-to-Point Protocol
PPPoA	PPP over ATM
PPPoE	PPP over Ethernet
PPTP	Point-to-Point Tunneling Protocol
PVC	permanent virtual circuit
QoS	quality of service
RADIUS	Remote Authentication Dial-In User Service
RIB	Routing Information Base
RIP	Routing Information Protocol
RIPng	RIP next generation
Rx	receive

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SNMP	Simple Network Management Protocol
SMTP	Simple Mail Transfer Protocol
SONET	Synchronous Optical Network
SSH	Secure Shell
STP	Spanning Tree Protocol
TACACS+	Terminal Access Controller Access Control System Plus
TCP	Transmission Control Protocol
ToS	Type of Service
Tx	transmit
UDP	User Datagram Protocol
vif	virtual interface
VLAN	virtual LAN
VPN	Virtual Private Network
VRRP	Virtual Router Redundancy Protocol
WAN	wide area network

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