



# CHAPTER 11

## Configuring Static Routing

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This chapter describes how to configure static routing on the switch.

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### Information About Static Routing

Routers forward packets using either route information from route table entries that you manually configure or the route information that is calculated using dynamic routing algorithms.

Static routes, which define explicit paths between two routers, cannot be automatically updated; you must manually reconfigure static routes when network changes occur. Static routes use less bandwidth than dynamic routes. No CPU cycles are used to calculate and analyze routing updates.

You can supplement dynamic routes with static routes where appropriate. You can redistribute static routes into dynamic routing algorithms but you cannot redistribute routing information calculated by dynamic routing algorithms into the static routing table.

You should use static routes in environments where network traffic is predictable and where the network design is simple. You should not use static routes in large, constantly changing networks because static routes cannot react to network changes. Most networks use dynamic routes to communicate between routers but may have one or two static routes configured for special cases. Static routes are also useful for specifying a gateway of last resort (a default router to which all unroutable packets are sent).

This section includes the following topics:

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- [Directly Connected Static Routes, page 11-2](#)
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## Administrative Distance

An administrative distance is the metric used by routers to choose the best path when there are two or more routes to the same destination from two different routing protocols. An administrative distance guides the selection of one routing protocol (or static route) over another, when more than one protocol adds the same route to the unicast routing table. Each routing protocol is prioritized in order of most to least reliable using an administrative distance value.

Static routes have a default administrative distance of 1. A router prefers a static route to a dynamic route because the router considers a route with a low number to be the shortest. If you want a dynamic route to override a static route, you can specify an administrative distance for the static route. For example, if you have two dynamic routes with an administrative distance of 120, you would specify an administrative distance that is greater than 120 for the static route if you want the dynamic route to override the static route.

## Directly Connected Static Routes

You need to specify only the output interface (the interface on which all packets are sent to the destination network) in a directly connected static route. The router assumes the destination is directly attached to the output interface and the packet destination is used as the next hop address. The next-hop can be an interface, only for point-to-point interfaces. For broadcast interfaces, the next-hop must be an IPv4/IPv6 address.

## Fully Specified Static Routes

You must specify either the output interface (the interface on which all packets are sent to the destination network) or the next hop address in a fully specified static route. You can use a fully specified static route when the output interface is a multi-access interface and you need to identify the next-hop address. The next-hop address must be directly attached to the specified output interface.

## Floating Static Routes

A floating static route is a static route that the router uses to back up a dynamic route. You must configure a floating static route with a higher administrative distance than the dynamic route that it backs up. In this instance, the router prefers a dynamic route to a floating static route. You can use a floating static route as a replacement if the dynamic route is lost.

**Note**

By default, a router prefers a static route to a dynamic route because a static route has a smaller administrative distance than a dynamic route.

## Remote Next Hops for Static Routes

You can specify the next-hop address of a neighboring router that is not directly connected to the router for static routes with remote (non-directly attached) next-hops. If a static route has remote next-hops during data-forwarding, the next-hops are recursively used in the unicast routing table to identify the corresponding directly attached next-hop(s) that have reachability to the remote next-hops.

## BFD

This feature supports bidirectional forwarding detection (BFD). BFD is a detection protocol designed to provide fast forwarding-path failure detection times. BFD provides subsecond failure detection between two adjacent devices and can be less CPU-intensive than protocol hello messages because some of the BFD load can be distributed onto the data plane on supported modules.

BFD for BGP is supported on eBGP single-hop peers and iBGP single-hop peers. For iBGP single-hop peers using BFD, you must configure the update-source option in neighbor configuration mode. BFD is not supported on other iBGP peers or for multihop eBGP peers.

## BFD

This feature supports bidirectional forwarding detection (BFD). BFD is a detection protocol designed to provide fast forwarding-path failure detection times. BFD provides subsecond failure detection between two adjacent devices and can be less CPU-intensive than protocol hello messages because some of the BFD load can be distributed onto the data plane on supported modules. See the *Cisco Nexus 7000 Series NX-OS Interfaces Configuration Guide, Release 5.x* for more information.

## Virtualization Support

Static routes support Virtual Routing and Forwarding instances (VRFs). VRFs exist within virtual device contexts (VDCs). By default, Cisco NX-OS places you in the default VDC and default VRF unless you specifically configure another VDC and VRF. For more information, see the *Cisco Nexus 7000 Series NX-OS Virtual Device Context Configuration Guide, Release 5.x* . and see [Chapter 12, “Configuring Layer 3 Virtualization.”](#)

## Licensing Requirements for Static Routing

The following table shows the licensing requirements for this feature:

Product	License Requirement
Cisco NX-OS	Static routing requires no license. Any feature not included in a license package is bundled with the Cisco NX-OS system images and is provided at no extra charge to you. For a complete explanation of the Cisco NX-OS licensing scheme, see the <i>Cisco NX-OS Licensing Guide</i> . <b>Note</b> Make sure the LAN Base Services license is installed on the switch to enable Layer 3 interfaces.

## Prerequisites for Static Routing

Static routing has the following prerequisites:

- The next-hop address for a static route must be reachable or the static route will not be added to the unicast routing table.

## Guidelines and Limitations

Static routing has the following configuration guidelines and limitations:

- You can specify an interface as the next-hop address for a static route only for point-to-point interfaces such as GRE tunnels.

## Default Settings

Table 11-1 lists the default settings for static routing parameters.

**Table 11-1** Default Static Routing Parameters

Parameters	Default
administrative distance	1
RIP feature	disabled

## Configuring Static Routing

This section includes the following topics:

- [Configuring a Static Route, page 11-5](#)
- [Configuring Virtualization, page 11-6](#)



### Note

If you are familiar with the Cisco IOS CLI, be aware that the Cisco NX-OS commands for this feature might differ from the Cisco IOS commands that you would use.

## Configuring a Static Route

You can configure a static route on the router.

### BEFORE YOU BEGIN

Ensure that you are in the correct VDC (or use the **switchto vdc** command).

### SUMMARY STEPS

1. **configure terminal**
2. **ip route** *{ip-prefix | ip-addr ip-mask} {[next-hop | nh-prefix] | [interface next-hop | nh-prefix]} [tag tag-value [pref]]*  
or
3. **ipv6 route** *ip6-prefix {nh-prefix | link-local-nh-prefix} | {nh-prefix [interface] | link-local-nh-prefix [interface]} [tag tag-value [pref]]*
4. (Optional) **show {ip | ipv6} static-route**
5. (Optional) **copy running-config startup-config**

### DETAILED STEPS

	Command	Purpose
Step 1	<b>configure terminal</b>  <b>Example:</b> switch# configure terminal switch(config)#	Enters configuration mode.
Step 2	<b>ip route</b> <i>{ip-prefix   ip-addr ip-mask} {[next-hop   nh-prefix]   [interface next-hop   nh-prefix]} [tag tag-value [pref]]</i>  <b>Example:</b> switch(config)# ip route 192.0.2.0/8 ethernet 1/2 192.0.2.4	Configures a static route and the interface for this static route. You can optionally configure the next-hop address. The <i>pref</i> value sets the administrative distance. The range is from 1 to 255. The default is 1.
Step 3	<b>ipv6 route</b> <i>ip6-prefix {nh-prefix   link-local-nh-prefix}   (nexthop [interface]   link-local-nexthop [interface]) [tag tag-value [pref]]</i>  <b>Example:</b> switch(config)# ipv6 route 2001:0DB8::/48 6::6 ethernet 2/1	Configures a static route and the interface for this static route. You can optionally configure the next-hop address. The <i>preference</i> value sets the administrative distance. The range is from 1 to 255. The default is 1.

	Command	Purpose
Step 4	<b>show ip   ipv6} static-route</b>  <b>Example:</b> switch(config)# show ip static-route	(Optional) Displays information about static routes.
Step 5	<b>copy running-config startup-config</b>  <b>Example:</b> switch(config)# copy running-config startup-config	(Optional) Saves this configuration change.

This example shows how to configure a static route:

```
switch# configure terminal
switch(config)# ip route 192.0.2.0/8 192.0.2.10
switch(config)# copy running-config startup-config
```

Use the **no {ip | ipv6} static-route** command to remove the static route.

## Configuring Virtualization

You can configure a static route in a VRF.

### BEFORE YOU BEGIN

Ensure that you are in the correct VDC (or use the **switchto vdc** command).

### SUMMARY STEPS

1. **configure terminal**
2. **vrf context** *vrf-name*
3. **ip route** {*ip-prefix* | *ip-addr ip-mask*} {*next-hop* | *nh-prefix* | *interface*} [**tag** *tag-value* [*pref*]]
4. **ipv6 route** *ip6-prefix* {*nh-prefix* | *link-local-nh-prefix*} | {*nh-prefix* [*interface*] | *link-local-nh-prefix* [*interface*]} [**tag** *tag-value* [*pref*]]
5. (Optional) **show {ip | ipv6} static-route vrf** *vrf-name*
6. (Optional) **copy running-config startup-config**

### DETAILED STEPS

	Command	Purpose
Step 1	<b>configure terminal</b>  <b>Example:</b> switch# configure terminal switch(config)#	Enters configuration mode.
Step 2	<b>vrf context</b> <i>vrf-name</i>  <b>Example:</b> switch(config)# vrf context StaticVrf	Creates a VRF and enters VRF configuration mode.

	Command	Purpose
Step 3	<pre><b>ip route</b> {ip-prefix   ip-addr ip-mask} {next-hop   nh-prefix   interface} [<b>tag</b> tag-value [pref]]</pre> <p><b>Example:</b> switch(config-vrf)# ip route 192.0.2.0/8 ethernet 1/2</p>	Configures a static route and the interface for this static route. You can optionally configure the next-hop address. The <i>pref</i> value sets the administrative distance. The range is from 1 to 255. The default is 1.
Step 4	<pre><b>ip route</b> {ip-prefix   ip-addr ip-mask} {next-hop   nh-prefix   interface} [<b>tag</b> tag-value [pref]]</pre> <p><b>Example:</b> switch(config-vrf)# ip route 192.0.2.0/8 ethernet 1/2</p>	Configures a static route and the interface for this static route. You can optionally configure the next-hop address. The <i>preference</i> value sets the administrative distance. The range is from 1 to 255. The default is 1.
	<pre><b>ipv6 route</b> ip6-prefix {nh-prefix link-local-nh-prefix}   (nexthop [interface]   link-local-next-hop [interface]) [<b>tag</b> tag-value [pref]]</pre> <p><b>Example:</b> switch(config)# ipv6 route 2001:0DB8::/48 6::6 ethernet 2/1</p>	Configures a static route and the interface for this static route. You can optionally configure the next-hop address. The <i>preference</i> value sets the administrative distance. The range is from 1 to 255. The default is 1.
Step 5	<pre><b>show ip   ipv6} static-route vrf</b> vrf-name</pre> <p><b>Example:</b> switch(config-vrf)# show ip static-route</p>	(Optional) Displays information on static routes.
Step 6	<pre><b>copy running-config startup-config</b></pre> <p><b>Example:</b> switch(config-vrf)# copy running-config startup-config</p>	(Optional) Saves this configuration change.

This example shows how to configure a static route:

```
switch# configure terminal
switch(config)# vrf context StaticVrf
switch(config-vrf)# ip route 192.0.2.0/8 192.0.2.10
switch(config-vrf)# copy running-config startup-config
```

## Verifying the Static Routing Configuration

To display the static routing configuration information, use this command:

Command	Purpose
<b>show ip static-route</b>	Displays the configured static routes.
<b>show ipv6 static-route vrf vrf-name</b>	Displays static route information per-VRF.
<b>show ipv6 static-route</b>	Displays the configured static routes.

# Configuration Examples for Static Routing

This example shows how to configure static routing:

```
configure terminal
ip route 192.0.2.0/8 192.0.2.10
copy running-config startup-config
```

## Additional References

For additional information related to implementing static routing, see the following sections:

- [Related Documents, page 11-8](#)

## Related Documents

Related Topic	Document Title
Static Routing CLI	<i>Cisco Nexus 3000 Series Command Reference,</i>
VDCs	<i>Cisco Nexus 7000 Series NX-OS Virtual Device Context Configuration Guide, Release 5.x</i>

## Feature History for Static Routing

[Table 11-2](#) lists the release history for this feature.

**Table 11-2**      *Feature History for Static Routing*

Feature Name	Releases	Feature Information
BFD	5.0(2)N1(1)	This feature was introduced.
Static Routing	5.0(3)U1(1)	This feature was introduced.