



CHAPTER 13

Configuring Static Routing

This chapter describes how to configure static routing on the Cisco NX-OS device.

This chapter includes the following sections:

- [Information About Static Routing, page 13-1](#)
- [Licensing Requirements for Static Routing, page 13-3](#)
- [Prerequisites for Static Routing, page 13-3](#)
- [Guidelines and Limitations for Static Routing, page 13-4](#)
- [Default Settings, page 13-4](#)
- [Configuring Static Routing, page 13-4](#)
- [Verifying the Static Routing Configuration, page 13-8](#)
- [Configuration Examples for Static Routing, page 13-9](#)
- [Additional References, page 13-9](#)
- [Feature History for Static Routing, page 13-10](#)

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 might 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:

- [Administrative Distance, page 13-2](#)

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- [Directly Connected Static Routes, page 13-2](#)
- [Fully Specified Static Routes, page 13-2](#)
- [Floating Static Routes, page 13-2](#)
- [Remote Next Hops for Static Routes, page 13-3](#)
- [BFD, page 13-3](#)
- [Virtualization Support, page 13-3](#)

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 must 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.

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**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 (nondirectly 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 hops 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. 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 (VRF) instances. 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 [Chapter 14, “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> .

Prerequisites for Static Routing

Static routing has the following prerequisites:

- If the next-hop address for a static route is unreachable, the static route is not added to the unicast routing table.

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Guidelines and Limitations for Static Routing

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 generic routing encapsulation (GRE) tunnels.

Default Settings

Table 13-1 lists the default settings for static routing parameters.

Table 13-1 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 13-4](#)
- [Configuring Virtualization, page 13-5](#)
- [Verifying the Static Routing Configuration, page 13-8](#)



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

- configure terminal**
- ip route** {ip-prefix | ip-addr/ip-mask} [{next-hop | nh-prefix} | [interface next-hop | nh-prefix]] [name nexthop-name] [tag tag-value] [pref]
or
ipv6 route ip6-prefix {nh-prefix | link-local-nh-prefix} | {nh-prefix [interface] | link-local-nh-prefix [interface]} [name nexthop-name] [tag tag-value] [pref]
- (Optional) **show {ip | ipv6} static-route**

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4. (Optional) copy running-config startup-config

DETAILED STEPS

	Command	Purpose
Step 1	configure terminal Example: switch# configure terminal switch(config)#	Enters configuration mode.
Step 2	ip route { <i>ip-prefix</i> <i>ip-addr/ip-mask</i> } {[<i>next-hop</i> <i>nh-prefix</i>] [<i>interface</i> <i>next-hop</i> <i>nh-prefix</i>]} [name <i>nexthop-name</i>] [tag <i>tag-value</i>] [<i>pref</i>] Example: switch(config)# ip route 192.0.2.0/8 ethernet 1/2 192.0.2.4 ipv6 route <i>ip6-prefix</i> { <i>nh-prefix</i> <i>link-local-nh-prefix</i> } (<i>nexthop</i> [<i>interface</i>] <i>link-local-nexthop</i> [<i>interface</i>]) [name <i>nexthop-name</i>] [tag <i>tag-value</i>] [<i>pref</i>] Example: switch(config)# ipv6 route 2001:0DB8::/48 6::6 ethernet 2/1	Configures a static route and the interface for this static route. Use ? to display a list of supported interfaces. You can specify a null interface by using null 0 . 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. Configures a static route and the interface for this static route. Use ? to display a list of supported interfaces. You can specify a null interface by using null 0 . 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 3	show {ip ipv6} static-route Example: switch(config)# show ip static-route	(Optional) Displays information about static routes.
Step 4	copy running-config startup-config Example: switch(config)# copy running-config startup-config	(Optional) Saves this configuration change.

This example shows how to configure a static route for a null interface:

```
switch# configure terminal
switch(config)# ip route 1.1.1.1/32 null 0
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).

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SUMMARY STEPS

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

DETAILED STEPS

	Command	Purpose
Step 1	configure terminal Example: switch# configure terminal switch(config)#	Enters configuration mode.
Step 2	vrf context <i>vrf-name</i> Example: switch(config)# vrf context StaticVrf	Creates a VRF and enters VRF configuration mode.
Step 3	ip route { <i>ip-prefix</i> <i>ip-addr ip-mask</i> } { <i>next-hop</i> <i>nh-prefix</i> <i>interface</i> } [name <i>nexthop-name</i>] [tag <i>tag-value</i>] [<i>pref</i>] Example: switch(config-vrf)# ip route 192.0.2.0/8 ethernet 1/2	Configures a static route and the interface for this static route. Use ? to display a list of supported interfaces. You can specify a null interface by using null 0 . 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.
	ipv6 route <i>ip6-prefix</i> { <i>nh-prefix</i> <i>link-local-nh-prefix</i> } (<i>nexthop</i> [<i>interface</i>] <i>link-local-nexthop</i> [<i>interface</i>]) [name <i>nexthop-name</i>] [tag <i>tag-value</i>] [<i>pref</i>] Example: switch(config)# ipv6 route 2001:0DB8::/48 6::6 ethernet 2/1	Configures a static route and the interface for this static route. Use ? to display a list of supported interfaces. You can specify a null interface by using null 0 . 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 4	show { ip ipv6 } static-route vrf <i>vrf-name</i> Example: switch(config-vrf)# show ip static-route	(Optional) Displays information on static routes.
Step 5	copy running-config startup-config Example: switch(config-vrf)# copy running-config startup-config	(Optional) Saves this configuration change.

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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
```

Configuring Layer 3 Routing Using a Mixed Chassis

A mixed chassis is a Cisco Nexus 7000 Series chassis that contains at least one M-Series module and at least one N7K-F132-15 module. Because the N7K-F132-15 module processes only Layer 2 traffic, you must use this configuration to pass Layer 3 traffic through the chassis.



Note

This is an optional procedure.

To configure a Layer 3 gateway in a mixed chassis, you use the proxy routing functionality. You enable routing on a specific VLAN by configuring a VLAN interface and the system automatically provides load-balanced routing functionality. (See the *Cisco Nexus 7000 Series NX-OS Interfaces Configuration Guide, Release 5.x*, for more information about Layer 3 routing and VLAN interfaces.)

Optionally, you can specify which physical interfaces on the N7K-M Series modules you want to use for Layer 3 routing.

BEFORE YOU BEGIN

You must configure a VLAN interface for each VLAN on the N7K-F132-15 module that you want to use the proxy-routing functionality in a mixed chassis.

You must have interfaces from both the M Series and the N7K-F132-15 modules in the same VDC.

SUMMARY STEPS

1. **configure terminal**
2. (Optional) **hardware proxy layer-3 routing {use | exclude} {module *mod-number* | interface *slot/port*} [module-type *fl*]**
3. **exit**
4. (Optional) **show hardware proxy layer-3 detail**
5. (Optional) **copy running-config startup-config**

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DETAILED STEPS

	Command	Purpose
Step 1	configure terminal Example: switch# configure terminal switch(config)#	Enters global configuration mode.
Step 2	hardware proxy layer-3 routing {use exclude} {module mod-number interface slot/port} [module-type f1] Example: switch(config)# hardware proxy layer-3 forwarding use module 1, 2-6,7	(Optional) Configures specific modules and physical interfaces on the N7K-M Series module to provide the proxy routing on the N7K-F132-15 module.
Step 3	exit Example: switch(config)# exit switch#	Exits configuration mode.
Step 4	show hardware proxy layer-3 detail Example: switch# show hardware proxy layer-3 detail	(Optional) Displays the information about the proxy Layer 3 functionality.
Step 5	copy running-config startup-config Example: switch# copy running-config startup-config	(Optional) Copies the running configuration to the startup configuration.

This example shows how to specify certain physical interfaces on the N7K-M Series modules to perform proxy routing on the N7K-F132-15 module in a mixed chassis:

```
switch# configure terminal
switch(config)# hardware proxy later-3 routing use module 1, 2-6, 7
switch(config)#
switch(config)#
```

Verifying the Static Routing Configuration

To display the static routing configuration, perform one of the following tasks:

Command	Purpose
show ip static-route	Displays the configured static routes.
show ipv6 static-route vrf vrf-name	Displays static route information for each VRF.
show ipv6 static-route	Displays the configured static routes.

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Command	Purpose
show hardware proxy layer-3 detail	Displays information on the proxy routing from an N7K-F132-15 module to the M Series module in the chassis that contains both types of modules.
show hardware proxy layer-3 counters { brief detail }	Displays the number of packets sent by the N7K-F132-15 modules to each M Series module for proxy forwarding. Note Enter the clear hardware proxy layer-3 counters command to clear the counters.

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
```

This example shows how to specify specific M Series modules to use in a chassis that contains both N7K-F132-15 and M Series modules:

```
switch# configure terminal
switch(config)# hardware proxy later-3 forwarding use module 1, 2-6, 7
switch(config)# show hardware proxy layer-3 detail
```

Additional References

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

- [Related Documents, page 13-9](#)

Related Documents

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

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Feature History for Static Routing

Table 13-2 lists the release history for this feature.

Table 13-2 *Feature History for Static Routing*

Feature Name	Releases	Feature Information
Layer 3 routing using a mixed chassis	5.1(1)	This feature was introduced.
Static routing	5.1(1)	Added the name option to the ip route command.
BFD	5.0(2)	Added support for BFD. See the <i>Cisco Nexus 7000 Series NX-OS Interfaces Configuration Guide, Release 5.x</i> , for more information.
Static routing	4.0(1)	This feature was introduced.