



# Configuring Bidirectional Forwarding Detection

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## Information About BFD

The Bidirectional Forwarding Detection (BFD) provides fast forwarding-path failure detection times for media types, encapsulations, topologies, and routing protocols. You can use BFD to detect forwarding path failures at a uniform rate, rather than at variable rates for different protocol hello mechanisms. BFD makes network profiling and planning easier and convergence time consistent and predictable.

BFD makes all routing and control plane applications less CPU intensive by offloading Layer 3 hello message adjacency detection to a single process. The BFD process runs uniformly for all applications and detects failures at subsecond intervals.

A BFD global configuration command is available for fabricpath interfaces. The **bfd** keyword in the `config-fabricpath-isis` command mode, enables BFD on all the FabricPath interfaces. The interface specific commands override the global values.

For FabricPath BFD, `fabricpath-isis` is the client. FabricPath-ISIS is a part of feature-set `fabricpath`.

## Asynchronous Mode

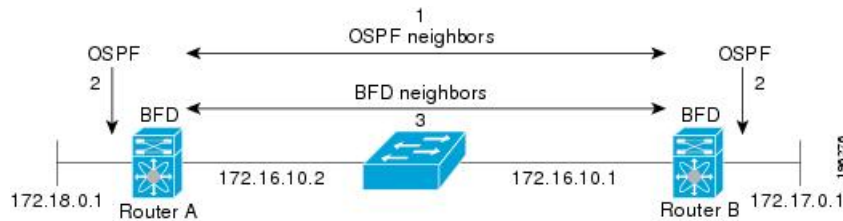
Cisco NX-OS supports the BFD asynchronous mode, which sends BFD control packets between two adjacent devices to activate and maintain BFD neighbor sessions between the devices. You configure BFD on both devices (or BFD neighbors). After BFD has been enabled on the interfaces and on the appropriate protocols,

Cisco NX-OS creates a BFD session, negotiates BFD session parameters, and begins to send BFD control packets to each BFD neighbor at the negotiated interval. The BFD session parameters include the following:

- Desired minimum transmit interval—The interval at which this device wants to send BFD hello messages.
- Required minimum receive interval—The minimum interval at which this device can accept BFD hello messages from another BFD device.
- Detect multiplier—The number of missing BFD hello messages from another BFD device before this local device detects a fault in the forwarding path.

The following figure shows how a BFD session is established. The figure shows a simple network with two routers running Open Shortest Path First (OSPF) and BFD. When OSPF discovers a neighbor (1), it sends a request to the local BFD process to initiate a BFD neighbor session with the OSPF neighbor router (2). The BFD neighbor session with the OSPF neighbor router is now established (3).

**Figure 1: Establishing a BFD Neighbor Relationship**



## Detection of Failures

After a BFD session has been established and timer negotiations are complete, BFD neighbors send BFD control packets that act in the same manner as an IGP hello protocol to detect liveness, except at a more accelerated rate. BFD detects a failure, but the protocol must take action to bypass a failed peer.

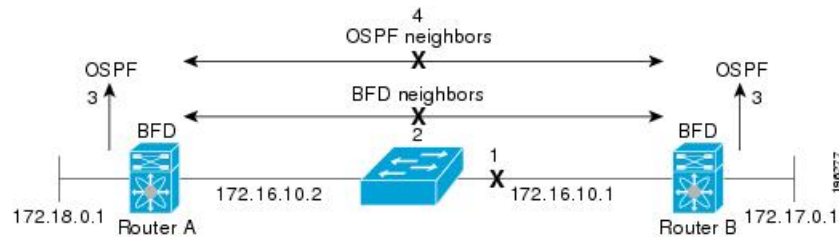
BFD sends a failure detection notice to the BFD-enabled protocols when it detects a failure in the forwarding path. The local device can then initiate the protocol recalculation process and reduce the overall network convergence time.

The following figure shows what happens when a failure occurs in the network (1). The BFD neighbor session with the OSPF neighbor router is torn down (2). BFD notifies the local OSPF process that the BFD neighbor is no longer reachable (3). The local OSPF process tears down the OSPF neighbor relationship (4). If an alternative path is available, the routers immediately start converging on it.



**Note** The BFD failure detection occurs in less than a second, which is much faster than OSPF Hello messages could detect the same failure.

Figure 2: Tearing Down an OSPF Neighbor Relationship



## BFD Echo Function

The BFD echo function sends echo packets from the forwarding engine to the remote BFD neighbor. The BFD neighbor forwards the echo packet back along the same path in order to perform detection; the BFD neighbor does not participate in the actual forwarding of the echo packets. The echo function and the forwarding engine are responsible for the detection process. BFD can use the slow timer to slow down the asynchronous session when the echo function is enabled and reduce the number of BFD control packets that are sent between two BFD neighbors. Also, the forwarding engine tests the forwarding path on the remote (neighbor) system without involving the remote system, so there is less interpacket delay variability and faster failure detection times.

The echo function is asymmetric when both BFD neighbors are running echo function.



**Note** Unicast Reverse Path Forwarding check (uRPF) is disabled by default. If you need to enable it on an interface functioning with BFD, the BFD echo function must be disabled.

## Security

Cisco NX-OS uses the packet Time to Live (TTL) value to verify that the BFD packets came from an adjacent BFD peer. For all asynchronous and echo request packets, the BFD neighbor sets the TTL value to 255 and the local BFD process verifies the TTL value as 255 before processing the incoming packet. For the echo response packet, BFD sets the TTL value to 254.

You can configure SHA-1 authentication of BFD packets.

## Virtualization Support

BFD supports virtual routing and forwarding (VRF) instances.

## Licensing Requirements for BFD

The following table shows the licensing requirements for this feature:

Product	License Requirement
Cisco NX-OS	BFD requires a LAN Base Services license. For a complete explanation of the Cisco NX-OS licensing scheme and how to obtain and apply licenses, see the <i>Cisco NX-OS Licensing Guide</i> .

## Prerequisites

BFD has the following prerequisites:

- You must enable the BFD feature, see [Enabling the BFD Feature, on page 6](#).
- For any client protocols that you want to enable BFD on, enable BFD in that client protocol, see [Configuring BFD Support for Routing Protocols, on page 13](#).
- Disable ICMPv4 redirect messages alone on Cisco Nexus 6000 Series platforms.
- See other detailed prerequisites that are listed with the configuration tasks.

## Guidelines and Limitations

BFD has the following configuration guidelines and limitations for the Cisco Nexus 6000 Series switch:

- BFD supports BFD version 1.
- BFD supports IPv4.
- BFD supports single-hop BFD.
- BFD supports the Border Gateway Protocol (BGP).
- BFD for BGP supports single-hop External Border Gateway Protocol (EBGP) and internal Border Gateway Protocol (iBGP) peers.
- BFD supports the Enhanced Interior Gateway Routing Protocol (EIGRP).
- BFD supports the Open Shortest Path First (OSPF) routing protocol.
- BFD supports keyed SHA-1 authentication.
- BFD supports the following Layer 3 interfaces: physical interfaces, port channels, subinterfaces, and VLAN interfaces.
- BFD does not support Anycast HSRP.
- BFD depends on Layer 3 adjacency information to discover topology changes, including Layer 2 topology changes. A BFD session on a VLAN interface (SVI) may not be up after the convergence of the Layer 2 topology if there is no Layer 3 adjacency information available.
- Port-channel configuration limitations are as follows:
  - Fabricpath BFD sessions are not supported on a port channel logical interface on any type of a line card.

- For Layer 3 port channels used by BFD, you must enable Link Aggregation Control Protocol (LACP) on the port channel.
- For Layer 2 port channels used by SVI sessions, you must enable LACP on the port channel.
- BFD is supported on SVI interfaces that are formed over virtual port channels (vPCs), vPC peer-links and FabricPath links.
- SVI limitations are as follows:
  - An ASIC reset causes traffic disruption for other ports and could possibly cause SVI sessions on other ports to flap.
  - When you change the topology (for example, when you add or delete a link into a VLAN or delete a member from a Layer 2 port channel), the SVI session could be affected. The SVI session might go down first and then come up after the topology discovery is finished.



**Tip** If you do not want the SVI sessions to flap and you need to change the topology, you can disable the BFD feature before making the changes and reenale BFD after the changes have been made. You can also configure the BFD timer to be a large value (for example, 5 seconds), and change it back to a fast timer after the topology change is complete.

- When you configure the BFD Echo function on the distributed Layer 3 port channels, reloading a member module flaps the BFD session hosted on that module, which results in a packet loss.

## BFD Default Settings

The following table lists the default settings for BFD parameters.

Parameter	Default
BFD feature	Disabled
Required minimum receive interval	50 milliseconds
Desired minimum transmit interval	50 milliseconds
Detect multiplier	3
Echo function	Enabled
Mode	Asynchronous
Port channel	Logical mode (one session per source-destination pair address)
Slow timer	2000 milliseconds
Subinterface optimization	Disabled

# Configuring BFD

## BFD Configuration Hierarchy



**Note** Using BFD per-link mode and subinterface optimization simultaneously on a Layer 3 port channel is not supported.

For physical ports that are members of a port channel, the member port inherits the master port-channel BFD configuration. The member port subinterfaces can override the master port-channel BFD configuration, unless subinterface optimization is enabled.

## Task Flow for Configuring BFD

### Procedure

- Step 1** Enable the BFD feature.
- Step 2** Configure global BFD parameters or configure BFD on an interface.
- Step 3** Configure BFD support for routing protocols.

## Enabling the BFD Feature

### Before you begin

You must enable the BFD feature before you can configure BFD on an interface and protocol within a device VRF.

Ensure that you are in the correct VRF when you are about to change the BFD configuration at the protocol global level (for example, for OSPF or BGP).

### Procedure

	Command or Action	Purpose
<b>Step 1</b>	switch# <b>configure terminal</b>	Enters global configuration mode.
<b>Step 2</b>	switch(config)# <b>feature bfd</b>	Enables BFD.
<b>Step 3</b>	(Optional) switch(config)# <b>show feature   include bfd</b>	Displays enabled and disabled features.
<b>Step 4</b>	(Optional) switch(config)# <b>copy running-config startup-config</b>	Saves the change persistently through reboots and restarts by copying the running configuration to the startup configuration.

### Example

This example shows how to enable BFD:

```
switch# configure terminal
switch(config)# feature bfd
switch(config)# show feature | include bfd
switch(config)# copy running-config startup-config
```

## Configuring Global BFD Parameters

### Before you begin

You can configure the BFD session parameters for all BFD sessions on the device. The BFD session parameters are negotiated between the BFD peers in a three-way handshake.

See [Configuring BFD on an Interface, on page 8](#) to override these global session parameters on an interface.

Ensure that you are in the correct VRF.

Enable the BFD feature. See [Enabling the BFD Feature, on page 6](#).

### Procedure

	Command or Action	Purpose
Step 1	switch# <b>configure terminal</b>	Enters global configuration mode.
Step 2	switch(config)# <b>bfd</b> [ <b>fabricpath</b> ] <b>interval</b> <i>mintx min_rx msec multiplier value</i>	Configures the BFD session parameters for all BFD sessions on the device. You can override these values by configuring the BFD session parameters on an interface. Use the optional <b>fabricpath</b> keyword to configure the global parameters for fabricpath BFD sessions. The <i>mintx</i> and <b>min_rx msec</b> range is from 250 to 999 milliseconds, and the default is 250. The <b>multiplier value</b> range is from 3 to 50. The multiplier default is 3.  <b>Note</b> Starting from Cisco Nexus 7.0(0)N1(1) release onwards, the minimum <b>bfd minimum interval</b> value range is changed from 250 to 50 milliseconds.
Step 3	switch(config)# <b>bfd</b> [ <b>fabricpath</b> ] <b>slow-timer</b> <i>[milliseconds]</i>	Configures the slow timer used in the echo function. This value determines how fast BFD starts up a new session and at what speed the asynchronous sessions use for BFD control packets when the echo function is enabled. The slow-timer value is used as the new control packet interval, while the echo packets use the configured BFD intervals. The echo packets are

	Command or Action	Purpose
		used for link failure detection, while the control packets at the slower rate maintain the BFD session. The range is from 1000 to 30000 milliseconds. The default is 2000.
<b>Step 4</b>	switch(config)# <b>bfd echo-interface loopback</b> <i>interface number</i>	Configures the interface used for BFD echo frames. This command changes the source address for the echo packets to the one configured on the specified loopback interface. The interface number range is from 0 to 1023.
<b>Step 5</b>	(Optional) switch(config)# <b>show running-config bfd</b>	Displays the BFD running configuration.
<b>Step 6</b>	(Optional) switch(config)# <b>copy running-config startup-config</b>	Saves the change persistently through reboots and restarts by copying the running configuration to the startup configuration.

### Example

This example shows how to configure global BFD parameters:

```
switch# configure terminal
switch(config)# bfd interval 250 min_rx 250 multiplier 3
switch(config)# bfd slow-timer 2000
switch(config)# bfd echo-interface loopback 1 3
switch(config-if)# show running-config bfd
switch(config-if)# copy running-config startup-config
```

## Configuring BFD on an Interface

You can configure the BFD session parameters for all BFD sessions on an interface. The BFD session parameters are negotiated between the BFD peers in a three-way handshake.

This configuration overrides the global session parameters for the configured interface.



**Note** You can use **bfd [fabricpath]** commands on an interface in fabricpath mode. The interface should be configured with **switchport mode fabricpath** to enable fabricpath mode.

### Before you begin

Ensure that you are in the correct VRF.

Enable the BFD feature. See [Enabling the BFD Feature, on page 6](#).



**Procedure**

	<b>Command or Action</b>	<b>Purpose</b>
<b>Step 1</b>	switch# <b>configure terminal</b>	Enters global configuration mode.
<b>Step 2</b>	switch(config)# <b>interface</b> <i>int-if</i>	Enters interface configuration mode. Use the ? keyword to display the supported interfaces.
<b>Step 3</b>	switch(config-if)# <b>bfd</b> [ <b>fabricpath</b> ]	Enables fabricpath BFD at the interface level.
<b>Step 4</b>	switch(config-if)# <b>bfd</b> [ <b>fabricpath</b> ] <b>interval</b> <i>mintx</i> <b>min_rx</b> <i>msec</i> <b>multiplier</b> <i>value</i>	Configures the BFD session parameters for all BFD sessions on the interface. These values override the global BFD session parameters. Use the optional <b>fabricpath</b> keyword to configure the global parameters for fabricpath BFD sessions. The <i>mintx</i> and <i>msec</i> range is from 50 to 999 milliseconds and the default is 250. The multiplier range is from 3 to 50. The multiplier default is 3.
<b>Step 5</b>	(Optional) switch(config-if)# <b>bfd</b> [ <b>fabricpath</b> ] <b>authentication keyed-SHA1</b> <b>key-id</b> <i>id</i> { <b>hex-key</b> <i>hex-key</i>   <b>key</b> <i>ascii-key</i> }	Configures SHA-1 authentication for all BFD sessions on the interface. The <i>ascii_key</i> string is a secret key shared among BFD peers. The <i>id</i> value, a number between 0 and 255, is assigned to this particular <i>ascii_key</i> . BFD packets specify the key by ID, which allows the use of multiple active keys. To disable SHA-1 authentication on the interface, use the <b>no</b> form of this command.
<b>Step 6</b>	(Optional) switch(config-if)# <b>show running-config bfd</b>	Displays the BFD running configuration.
<b>Step 7</b>	(Optional) switch(config-if)# <b>copy running-config startup-config</b>	Saves the change persistently through reboots and restarts by copying the running configuration to the startup configuration.

**Example**

This example shows how to configure BFD on an interface:

```
switch# configure terminal
switch(config)# interface ethernet 2/1
switch(config-if)# bfd interval 250 min_rx 250 multiplier 3
switch(config-if)# bfd authentication keyed-SHA1 key-id 1 key cisco123
switch(config-if)# show running-config bfd
switch(config-if)# copy running-config startup-config
```

## Configuring BFD on a Port Channel

You can configure the BFD session parameters for all BFD sessions on a port channel. The BFD session parameters are negotiated between the BFD peers in a three-way handshake.

If you use per-link mode for Layer 3 port channels, BFD creates a session for each link in the port channel and provides an aggregate result to client protocols. For example, if the BFD session for one link on a port channel is up, BFD informs client protocols, such as OSPF, that the port channel is up.

This configuration overrides the global session parameters for the configured port channel. The member ports of the port channel inherit the port channel BFD session parameters, unless you configure subinterface-level BFD parameters on a member port. In that case, the member port subinterface uses the subinterface BFD configuration if subinterface optimization is not enabled. See [Optimizing BFD on Subinterfaces, on page 12](#) for more information.

### Before you begin

Ensure that you are in the correct VRF.

Ensure that you enable LACP on the port channel before you enable BFD.

Enable the BFD feature. See “Enabling the BFD Feature.”

### Procedure

	Command or Action	Purpose
<b>Step 1</b>	switch# <b>configure terminal</b>	Enters global configuration mode.
<b>Step 2</b>	switch(config)# <b>interface port-channel</b> <i>number</i>	Enters port channel configuration mode. Use the ? keyword to display the supported number range.
<b>Step 3</b>	switch(config-if)# <b>bfd per-link</b>	Configures the BFD sessions for each link in the port channel.
<b>Step 4</b>	switch(config-if)# <b>bfd fabricpath per-link</b>	Configures the BFD sessions for each link in the port channel.
<b>Step 5</b>	(Optional) switch(config-if)# <b>bfd [fabricpath] interval</b> <i>mintx</i> <b>min_rx</b> <i>msec</i> <b>multiplier</b> <i>value</i>	Configures the BFD session parameters for all BFD sessions on the port channel. These values override the global BFD session parameters. Use the optional <b>fabricpath</b> keyword to configure the global parameters for fabricpath BFD sessions. The <i>mintx</i> and <b>min_rx</b> <i>msec</i> range is from 50 to 999 milliseconds and the default is 50. The multiplier range is from 1 to 50. The multiplier default is 3.
<b>Step 6</b>	(Optional) switch(config-if)# <b>bfd [fabricpath] authentication keyed-SHA1 key-id</b> <i>id</i> { <b>hex-key</b> <i>hex-key</i>   <b>key</b> <i>ascii-key</i> }	Configures SHA-1 authentication for all BFD sessions on the interface. The <i>ascii_key</i> string is a secret key shared among BFD peers. The <i>id</i> value, a number between 0 and 255, is assigned to this particular <i>ascii_key</i> . BFD packets specify the key by ID, which allows the use of multiple active keys. To disable SHA-1 authentication on the interface, use the <b>no</b> form of this command.

	Command or Action	Purpose
<b>Step 7</b>	(Optional) switch(config-if)# <b>show running-config bfd</b>	Displays the BFD running configuration.
<b>Step 8</b>	(Optional) switch(config-if)# <b>copy running-config startup-config</b>	Saves the change persistently through reboots and restarts by copying the running configuration to the startup configuration.

### Example

This example shows how to configure BFD on a port channel:

```
switch# configure terminal
switch(config)# interface port-channel 2
switch(config-if)# bfd interval 250 min_rx 250 multiplier 3
switch(config-if)# bfd authentication keyed-SHA1 key-id 1 key cisco123
switch(config-if)# show running-config bfd
switch(config-if)# copy running-config startup-config
```

## Configuring BFD Echo Function

You can configure the BFD echo function on one or both ends of a BFD-monitored link. The echo function slows down the required minimum receive interval, based on the configured slow timer. The RequiredMinEchoRx BFD session parameter is set to zero if the echo function is disabled. The slow timer becomes the required minimum receive interval if the echo function is enabled.

You can configure a fabricpath (L2) BFD session on any port belonging to any VLAN provided the default VLAN (VLAN 1) is configured in fabricpath mode. It is a requirement that the default VLAN 1 is in fabricpath mode for fabricpath BFD sessions to come up.



**Note** Echo mode is not supported on fabricpath interfaces.

### Before you begin

Ensure that you are in the correct VRF.

Enable the BFD feature. See [Enabling the BFD Feature, on page 6](#).

Configure the BFD session parameters. See [Configuring Global BFD Parameters, on page 7](#) or [Configuring BFD on an Interface, on page 8](#).

Ensure that ICMP redirect messages are disabled on BFD-enabled interfaces. Use the **no ip redirects** command or the **no ipv6 redirects** command on the interface.

Ensure that the IP packet verification check for identical IP source and destination addresses is disabled.

### Procedure

	Command or Action	Purpose
<b>Step 1</b>	switch# <b>configure terminal</b>	Enters global configuration mode.

	Command or Action	Purpose
<b>Step 2</b>	switch(config)# <b>bfd [fabricpath] slow-timer</b> [milliseconds]	Configures the slow timer used in the echo function. This value determines how fast BFD starts up a new session and is used to slow down the asynchronous sessions when the BFD echo function is enabled. This value overwrites the required minimum receive interval when the echo function is enabled. The range is from 1000 to 30000 milliseconds. The default is 2000.
<b>Step 3</b>	switch(config)# <b>interface int-if</b>	Enters interface configuration mode. Use the ? keyword to display the supported interfaces.
<b>Step 4</b>	switch(config-if)# <b>bfd echo</b>	Enables the echo function. The default is enabled.
<b>Step 5</b>	(Optional) switch(config-if)# <b>show running-config bfd</b>	Displays the BFD running configuration.
<b>Step 6</b>	(Optional) switch(config-if)# <b>copy running-config startup-config</b>	Saves the change persistently through reboots and restarts by copying the running configuration to the startup configuration.

### Example

This example shows how to configure the BFD Echo Function.

```
switch# configure terminal
switch(config)# bfd slow-timer 2000
switch(config)# interface ethernet 2/1
switch(config-if)# bfd echo
switch(config-if)# show running-config bgp
switch(config-if)# copy running-config startup-config
```

## Optimizing BFD on Subinterfaces

You can optimize BFD on subinterfaces. BFD creates sessions for all configured subinterfaces. BFD sets the subinterface with the lowest configured VLAN ID as the master subinterface, and that subinterface uses the BFD session parameters of the parent interface. The remaining subinterfaces use the slow timer. If the optimized subinterface session detects an error, BFD marks all subinterfaces on that physical interface as down.

### Before you begin

Ensure that you are in the correct VRF.

Enable the BFD feature. See [Enabling the BFD Feature, on page 6](#).

Configure the BFD session parameters. See [Configuring Global BFD Parameters, on page 7](#) or [Configuring BFD on an Interface, on page 8](#).

Ensure that these subinterfaces connect to another Cisco NX-OS device. This feature is supported on Cisco NX-OS only.

**Procedure**

	<b>Command or Action</b>	<b>Purpose</b>
<b>Step 1</b>	switch# <b>configure terminal</b>	Enters global configuration mode.
<b>Step 2</b>	switch(config)# <b>interface int-if</b>	Enters interface configuration mode. Use the ? keyword to display the supported interfaces.
<b>Step 3</b>	switch(config-if)# <b>bfd optimize subinterface</b>	Optimizes subinterfaces on a BFD-enabled interface. The default is disabled.
<b>Step 4</b>	(Optional) switch(config-if)# <b>show running-config bfd</b>	Displays the BFD running configuration.
<b>Step 5</b>	(Optional) switch(config-if)# <b>copy running-config startup-config</b>	Saves the change persistently through reboots and restarts by copying the running configuration to the startup configuration.

**Example**

This example shows how to optimize BFD on an interface:

```
switch# configure terminal
switch(config)# interface ethernet 2/1
switch(config-if)# bfd optimize subinterface
switch(config-if)# show running-config bfd
switch(config-if)# copy running-config startup-config
```

## Configuring BFD Support for Routing Protocols

The Cisco Nexus 6000 Series switches provide BFD support for these routing protocols:

- Border Gateway Protocol (BGP)
- Enhanced Interior Gateway Routing Protocol (EIGRP)
- Open Shortest Path First Version 2 (OSPFv2)
- Hot Standby Router Protocol (HSRP)
- Virtual Router Redundancy Protocol (VRRP)
- Static routes
- Protocol-Independent Multicast (PIM)
- FabricPath on Intermediate System to Intermediate System (IS-IS)



**Note** The BFD support for routing protocols are supported from version 6.0(2)N2(2) and later.

## Configuring BFD on BGP

You can configure BFD for the Border Gateway Protocol (BGP).

### Before you begin

Enable the BFD feature. See [Enabling the BFD Feature, on page 6](#).

Configure the BFD session parameters. See [Configuring Global BFD Parameters, on page 7](#) or [Configuring BFD on an Interface, on page 8](#).

Enable the BGP feature.

See the *Cisco Nexus 6000 Series NX-OS Unicast Routing Configuration Guide, Release 6.x*, for more information.

### Procedure

	Command or Action	Purpose
<b>Step 1</b>	switch# <b>configure terminal</b>	Enters global configuration mode.
<b>Step 2</b>	switch(config)# <b>router bgp</b> <i>as-number</i>	Enables BGP and assigns the AS number to the local BGP speaker. The AS number can be a 16-bit integer or a 32-bit integer in the form of a higher 16-bit decimal number and a lower 16-bit decimal number in xx.xx format.
<b>Step 3</b>	switch(config-router)# <b>neighbor</b> { <i>ip-address</i> } <b>remote-as</b> <i>as-number</i>	Configures the IPv4 address and AS number for a remote BGP peer. The <i>ip-address</i> format is x.x.x.x.
<b>Step 4</b>	switch(config-router-neighbor)# <b>bfd</b>	Enables BFD for this BGP peer.
<b>Step 5</b>	switch(config-router-neighbor)# <b>update-source</b> <i>interface-type number</i>	Brings up BFD for this BGP peer.
<b>Step 6</b>	(Optional) switch(config-router-neighbor)# <b>show running-config bgp</b>	Displays the BGP running configuration.
<b>Step 7</b>	(Optional) switch(config-router-neighbor)# <b>copy running-config startup-config</b>	Saves the change persistently through reboots and restarts by copying the running configuration to the startup configuration.

### Example

This example shows how to configure BFD on BGP:

```
switch# configure terminal
switch(config)# router bgp 64496
switch(config-router)# neighbor 209.165.201.1 remote-as 64497
switch(config-router-neighbor)# bfd
switch(config-router-neighbor)# update-source ethernet 2/1
switch(config-router-neighbor)# show running-config bgp
switch(config-router-neighbor)# copy running-config startup-config
```

## Configuring BFD on EIGRP

### Before you begin

Ensure that you are in the correct VRF.

Enable the BFD feature. See [Enabling the BFD Feature, on page 6](#).

Configure the BFD session parameters. See [Configuring Global BFD Parameters, on page 7](#) or [Configuring BFD on an Interface, on page 8](#).

Enable the EIGRP feature.

See the *Cisco Nexus 6000 Series NX-OS Unicast Routing Configuration Guide, Release 6.x*, for more information.

### Procedure

	Command or Action	Purpose
<b>Step 1</b>	switch# <b>configure terminal</b>	Enters global configuration mode.
<b>Step 2</b>	switch(config)# <b>router eigrp</b> <i>instance-tag</i>	Creates a new EIGRP process with the configured instance tag. The instance tag can be any case-sensitive, alphanumeric string up to 20 characters.  If you configure an <i>instance-tag</i> that does not qualify as an AS number, you must use the <b>autonomous-system</b> command to configure the AS number explicitly, or this EIGRP instance remains in the shutdown state.
<b>Step 3</b>	(Optional) switch(config-router)# <b>bfd</b>	Enables BFD for this EIGRP router.
<b>Step 4</b>	switch(config-router)# <b>interface</b> <i>int-if</i>	Enters interface configuration mode. Use the ? keyword to display the supported interfaces.
<b>Step 5</b>	(Optional) switch(config-if)# <b>ip eigrp</b> <i>instance-tag</i> <b>bfd</b>	Enables or disables BFD on an EIGRP interface. The instance tag can be any case-sensitive, alphanumeric string up to 20 characters.  The default is disabled.
<b>Step 6</b>	(Optional) switch(config-if)# <b>show ip eigrp</b> [ <i>vrf vrf-name</i> ] [ <b>interface</b> <i>if</i> ]	Displays the EIGRP running configuration.
<b>Step 7</b>	(Optional) switch(config-if)# <b>copy running-config startup-config</b>	Saves the change persistently through reboots and restarts by copying the running configuration to the startup configuration.

### Example

This example shows how to configure BFD on EIGRP:

```

switch# configure terminal
switch(config)# router eigrp Test1
switch(config-router)# bfd
switch(config-router)# interface ethernet 2/1
switch(config-if)# ip eigrp Test1 bfd
switch(config-if)# show ip eigrp
switch(config-if)# copy running-config startup-config

```

## Configuring BFD on OSPF

You can configure BFD for the Open Shortest Path First version 2 (OSPFv2).

### Before you begin

Enable the BFD feature. See [Enabling the BFD Feature, on page 6](#).

Configure the BFD session parameters. See [Configuring Global BFD Parameters, on page 7](#) or [Configuring BFD on an Interface, on page 8](#).

Enable the OSPF feature.

See the *Cisco Nexus 6000 Series NX-OS Unicast Routing Configuration Guide, Release 6.x*, for more information.

### Procedure

	Command or Action	Purpose
<b>Step 1</b>	switch# <b>configure terminal</b>	Enters global configuration mode.
<b>Step 2</b>	switch(config)# <b>router ospf</b> <i>instance-tag</i>	Creates a new OSPFv2 instance with the configured instance tag. The instance tag can be any case-sensitive, alphanumeric string up to 20 characters.
<b>Step 3</b>	(Optional) switch(config-router)# <b>bfd</b>	Enables BFD for this OSPFv2 instance. Each OSPFv2 interface must also be enabled or disabled.
<b>Step 4</b>	switch(config-router)# <b>interface</b> <i>int-if</i>	Enters interface configuration mode. Use the ? keyword to display the supported interfaces.
<b>Step 5</b>	(Optional) switch(config-if)# <b>ip ospf bfd</b>	Enables or disables BFD on an OSPFv2 interface. The default is disabled.
<b>Step 6</b>	(Optional) switch(config-if)# <b>show ip ospf</b> [ <b>vrf</b> <i>vrf-name</i> ] [ <b>interface</b> <i>if</i> ]	Displays the OSPF running configuration.
<b>Step 7</b>	(Optional) switch(config-if)# <b>copy running-config startup-config</b>	Saves the change persistently through reboots and restarts by copying the running configuration to the startup configuration.

### Example

This example shows how to configure BFD on OSPF:



```

switch# configure terminal
switch(config)# router ospf 201
switch(config-router)# bfd
switch(config-router)# interface ethernet 2/1
switch(config-if)# ip ospf bfd
switch(config-if)# show ip ospf
switch(config-if)# copy running-config startup-config

```

## Configuring BFD on HSRP

You can configure BFD for the Hot Standby Router Protocol (HSRP). The active and standby HSRP routers track each other through BFD.

If BFD on the standby HSRP router detects that the active HSRP router is down, the standby HSRP router treats this event as an active timer expiry and takes over as the active HSRP router. The **show hsrp detail** command shows this event as BFD@Act-down or BFD@Sby-down.

### Before you begin

Ensure that you are in the correct VRF.

Enable the BFD feature. See [Enabling the BFD Feature, on page 6](#).

Configure the BFD session parameters. See [Configuring Global BFD Parameters, on page 7](#) or [Configuring BFD on an Interface, on page 8](#).

Enable the HSRP feature. See the Cisco Nexus 6000 Series NX-OS Unicast Routing Configuration Guide, Release 6.x, for more information.

### Procedure

	Command or Action	Purpose
<b>Step 1</b>	switch# <b>configure terminal</b>	Enters global configuration mode.
<b>Step 2</b>	(Optional) switch(config)# <b>hsrp bfd all-interfaces</b>	Enables or disables BFD on all HSRP interfaces. The default is disabled.
<b>Step 3</b>	switch(config)# <b>interface int-if</b>	Enters interface configuration mode. Use the ? keyword to display the supported interfaces.
<b>Step 4</b>	(Optional) switch(config-if)# <b>hsrp bfd</b>	Enables or disables BFD on an HSRP interface. The default is disabled.
<b>Step 5</b>	(Optional) switch(config-if)# <b>show running-config hsrp</b>	Displays the HSRP running configuration.
<b>Step 6</b>	(Optional) switch(config-if)# <b>copy running-config startup-config</b>	Saves the change persistently through reboots and restarts by copying the running configuration to the startup configuration.

### Example

This example shows how to configure BFD on HSRP:

```

switch# configure terminal
switch(config)# hsrp bfd all-interfaces
switch(config)# interface ethernet 2/1
switch(config-if)# hsrp bfd
switch(config-if)# show running-config hsrp
switch(config-if)# copy running-config startup-config

```

## Configuring BFD on VRRP

You can configure BFD for the Virtual Router Redundancy Protocol (VRRP). The active and standby VRRP routers track each other through BFD. If BFD on the standby VRRP router detects that the active VRRP router is down, the standby VRRP router treats this event as an active timer expiry and takes over as the active VRRP router.

The **show vrrp detail** command shows this event as BFD@Act-down or BFD@Sby-down.

### Before you begin

Ensure that you are in the correct VRF.

Enable the BFD feature. See [Enabling the BFD Feature, on page 6](#).

Configure the BFD session parameters. See [Configuring Global BFD Parameters, on page 7](#) or [Configuring BFD on an Interface, on page 8](#).

Enable the VRRP feature.

See the *Cisco Nexus 6000 Series NX-OS Unicast Routing Configuration Guide, Release 6.x*, for more information.

### Procedure

	Command or Action	Purpose
<b>Step 1</b>	switch# <b>configure terminal</b>	Enters global configuration mode.
<b>Step 2</b>	switch(config)# <b>interface</b> <i>int-if</i>	Enters interface configuration mode. Use the ? keyword to display the supported interfaces.
<b>Step 3</b>	switch(config-if)# <b>vrrp</b> <i>group-no</i>	Specifies the VRRP group number.
<b>Step 4</b>	switch(config-if-vrrp)# <b>vrrp bfd</b> <i>address</i>	Enables or disables BFD on an VRRP interface. The default is disabled.
<b>Step 5</b>	(Optional) switch(config-if-vrrp)# <b>show running-config vrrp</b>	Displays the VRRP running configuration.
<b>Step 6</b>	(Optional) switch(config-if-vrrp)# <b>copy running-config startup-config</b>	Saves the change persistently through reboots and restarts by copying the running configuration to the startup configuration.

### Example

This example shows how to configure BFD on VRRP:

```

switch# configure terminal
switch(config)# interface ethernet 2/1
switch(config-if)# vrrp 1
switch(config-if-vrrp)# vrrp bfd 10.0.0.10
switch(config-if-vrrp)# show running-config vrrp
switch(config-if-vrrp)# copy running-config startup-config

```

## Configuring BFD on Static Routes

You can configure BFD for static routes on an interface. You can optionally configure BFD on a static route within a virtual routing and forwarding (VRF) instance.

### Before you begin

Ensure that you are in the correct VRF.

Enable the BFD feature. See [Enabling the BFD Feature, on page 6](#).

Configure the BFD session parameters. See [Configuring Global BFD Parameters, on page 7](#) or [Configuring BFD on an Interface, on page 8](#).

Enable the HSRP feature. See the Cisco Nexus 6000 Series NX-OS Unicast Routing Configuration Guide, Release 6.x, for more information.

### Procedure

	Command or Action	Purpose
<b>Step 1</b>	switch# <b>configure terminal</b>	Enters global configuration mode.
<b>Step 2</b>	(Optional) switch(config)# <b>vrf context</b> <i>vrf-name</i>	Enters VRF configuration mode.
<b>Step 3</b>	switch(config-vrf)# <b>ip route</b> { <i>network-address</i>   <i>network-prefix</i> }	Creates a static route Use the ? keyword to display the supported interfaces.
<b>Step 4</b>	switch(config-vrf)# <b>ip route static bfd</b> <b>interface</b> { <i>nh-address</i>   <i>nh-prefix</i> }	Enables BFD for all static routes on an interface. Use the ? keyword to display the supported interfaces.
<b>Step 5</b>	(Optional) switch(config-vrf)# <b>show ip route</b> <b>static</b> [ <b>vrf</b> <i>vrf-name</i> ]	Displays the static routes.
<b>Step 6</b>	(Optional) switch(config-vrf)# <b>copy</b> <b>running-config startup-config</b>	Saves the configuration persistently through reboots and restarts by copying the running configuration to the startup configuration.

### Example

This example shows how to configure BFD on static routes:

```

switch# configure terminal
switch(config)# vrf context Red
switch(config-vrf)# ip route 1.1.1.0/24 ethernet 2/1 192.0.2.1
switch(config-vrf)# ip route static bfd ethernet 2/1 192.0.2.4

```

```
switch(config-vrf) # show ip route static vrf Red
switch(config-vrf) # copy running-config startup-config
```

## Configuring BFD on PIM

You can configure BFD for the Protocol Independent Multicast (PIM) protocol.

### Before you begin

Ensure that you are in the correct VRF.

Enable the BFD feature. See [Enabling the BFD Feature, on page 6](#).

Configure the BFD session parameters. See [Configuring Global BFD Parameters, on page 7](#) or [Configuring BFD on an Interface, on page 8](#).

Enable the PIM feature. See the *Cisco Nexus 6000 Series NX-OS Multicast Routing Configuration Guide, Release 6.x*, for more information.

### Procedure

	Command or Action	Purpose
<b>Step 1</b>	switch# <b>configure terminal</b>	Enters global configuration mode.
<b>Step 2</b>	switch(config)# <b>ip pim bfd</b>	Enables BFD for PIM.
<b>Step 3</b>	switch(config)# <b>interface int-if</b>	Enters interface configuration mode. Use the ? keyword to display the supported interfaces.
<b>Step 4</b>	(Optional) switch(config-if)# <b>ip pim bfd-instance [disable]</b>	Enables or disables BFD on a PIM interface. The default is disabled.
<b>Step 5</b>	(Optional) switch(config-if)# <b>show running-config pim</b>	Displays the PIM running configuration.
<b>Step 6</b>	(Optional) switch(config-if)# <b>copy running-config startup-config</b>	Saves the configuration persistently through reboots and restarts by copying the running configuration to the startup configuration.

### Example

This example shows how to configure BFD on PIM:

```
switch# configure terminal
switch(config)# ip pim bfd
switch(config)# interface ethernet 2/1
switch(config-if)# ip pim bfd-instance
switch(config-if)# show running-config pim
switch(config-if)# copy running-config startup-config
```

## Disabling BFD on an Interface

You can selectively disable BFD on an interface for a routing protocol that has BFD enabled at the global or VRF level.

To disable BFD on an interface, use one of the following commands in interface configuration mode:

#### Procedure

	Command or Action	Purpose
<b>Step 1</b>	<pre>switch(config)# ip eigrp instance-tag bfd disable</pre> <p><b>Example:</b></p> <pre>switch(config)# ip eigrp Test1 bfd disable</pre>	Disables BFD on an EIGRP interface. The instance tag can be any case-sensitive, alphanumeric string up to 20 characters.
<b>Step 2</b>	<pre>switch(config-if)# ip ospf bfd disable</pre> <p><b>Example:</b></p> <pre>switch(config-if)# ip ospf bfd disable</pre>	Disables BFD on an OSPFv2 interface.

## Configuring FabricPath BFD on All IS-IS Interfaces

#### Before you begin

- Ensure that you are in the correct VRF.
- Enable the BFD feature.
- Configure the BFD session parameters.
- The ISIS feature is enabled by default when entering the **feature-set fabricpath** command.
- See the *Cisco Nexus 6000 Series NX-OS Unicast Routing Configuration Guide, Release 7.x*, for more information.
- 

#### Procedure

	Command or Action	Purpose
<b>Step 1</b>	<pre>switch# configure terminal</pre>	Enters global configuration mode.
<b>Step 2</b>	<pre>switch(config)# fabricpath domain default</pre>	Enters the global FabricPath Layer 2 Intermediate System, to Intermediate System (IS-IS) configuration mode.
<b>Step 3</b>	<pre>switch(config-fabricpath-isis)# bfd</pre>	Enables FabricPath BFD on all IS-IS interfaces.

#### Example

This example show how to configure FabricPath BFD on all IS-IS interfaces:

```
switch# configure terminal
switch(config)# fabricpath domain default
switch(config-fabricpath-isis)# bfd
```

## Configuring FabricPath BFD on a Specific Interface

### Before you begin

- Enable the BFD feature.
- Configure the BFD session parameters.
- The ISIS feature is enabled by default when entering the **feature-set fabricpath** command.
- See the *Cisco Nexus 6000 Series NX-OS Unicast Routing Configuration Guide, Release 7.x*, for more information.
- 

### Procedure

	Command or Action	Purpose
<b>Step 1</b>	switch# <b>configure terminal</b>	Enters global configuration mode.
<b>Step 2</b>	switch(config)# <b>[no] bfd fabricpath encap-ce</b>	Enables the user to choose an encapsulation mode for the L2BFD frames on a per-session basis. On enabling the command, it sends out the frames without Fabricpath encapsulation. The default mode is to send frames with Fabricpath encapsulation.
<b>Step 3</b>	switch(config-if)# <b>fabricpath isis bfd</b>	Enables the FabricPath BFD on the interface.

### Example

This example shows how to configure FabricPath BFD on a specific interface:

```
switch# configure terminal
switch(config)# [no] bfd fabricpath encap-ce
switch(config-if)# fabricpath isis bfd
```

## Verifying the BFD Configuration

Use the following commands to verify BFD:

Command	Purpose
switch# <b>show running-config bfd</b>	Displays information about BFD for a supported application, such as BGP or OSPFv2.
switch# <b>show startup-config bfd</b>	Displays information about the BFD configuration that will be applied on startup.

For detailed information about the fields in the output from these commands, see the *Cisco Nexus 6000 Series NX-OS Interfaces Command Reference*.

## Monitoring BFD

Use the following commands to monitor BFD:

Command	Purpose
switch# <b>show bfd neighbors</b> [ <b>application name</b> ] [ <b>details</b> ]	Displays information about BFD for a supported application, such as BGP or OSPFv2.
switch# <b>show bfd neighbors</b> [ <b>interface int-if</b> ] [ <b>details</b> ]	Displays information about BFD on a specified interface.
switch# <b>show bfd neighbors</b> [ <b>dest-ip ip-address</b> ] [ <b>src-ip ip-address</b> ] [ <b>details</b> ]	Displays information about BFD on the specified session on an interface.
switch# <b>show bfd neighbors</b> [ <b>vrf vrf-name</b> ] [ <b>details</b> ]	Displays information about BFD for a VRF.
switch# <b>show bfd neighbors</b> [ <b>fabricpath</b> ] [ <b>dest-ip ip-address</b> ] [ <b>src-ip ip-address</b> ] [ <b>details</b> ]	Displays information about BFD on the specified session on an interface. Use the optional <b>fabricpath</b> keyword to display information about the specific fabricpath neighbor.
switch# <b>show bfd neighbors</b> [ <b>dest-sys-id dest-sys-id-value</b> ]	Displays information about a specific FabricPath neighbor.

For more details, see the *Cisco Nexus 6000 Series NX-OS Switch Interfaces Command Reference*.

## Configuration Examples for BFD

This example shows how to configure BFD for OSPFv2 on Ethernet 2/1, using the default BFD session parameters:

```
switch# configure terminal
switch(config)# feature bfd
switch(config)# feature ospf
switch(config)# router ospf Test1
switch(config-router)# interface ethernet 2/1
switch(config-if)# ip ospf bfd
switch(config-if)# no shutdown
```

This example shows how to configure BFD for all EIGRP interfaces, using the default BFD session parameters:

```
switch# configure terminal
switch(config)# feature bfd
switch(config)# feature eigrp
switch(config)# bfd interval 250 min_rx 250 multiplier 4
switch(config)# router eigrp Test2
switch(config-router)# bfd
```

## Related Documents

Related Topic	Document Title
BFD commands	See the <i>Cisco Nexus 6000 Series NX-OS Unicast Routing Command Reference, Release 6.x</i> , for more information.

## Related Standards

These industry standards cover Bidirectional Forwarding Detection.

RFC	Title
RFC 5880	<i>Bidirectional Forwarding Detection (BFD)</i>
RFC 5881	<i>BFD for IPv4 and IPv6 (Single Hop)</i>