

# BFD Commands

This module provides command line interface (CLI) commands for configuring Bidirectional Forwarding Detection (BFD) on the Cisco ASR 9000 Series Router.


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# address-family ipv4 unicast (BFD)

To enable Bidirectional Forwarding Detection (BFD) fast-detection on a specific IPV4 unicast destination address prefix and on the forwarding next-hop address, use the **address-family ipv4 unicast** command in static route configuration mode. To return the router to the default setting, use the **no** form of this command.

**address-family ipv4 unicast** *address nexthop* **bfd fast-detect** [**minimum interval** *interval*] [**multiplier** *multiplier*]
**no address-family ipv4 unicast** *address nexthop* **bfd fast-detect** [**minimum interval** *interval*] [**multiplier** *multiplier*]

## Syntax Description

| | |
|---|---|
| *address* | Specifies the IPv4 unicast destination address and prefix on which to enable BFD fast-detection. |
| *nexthop* | Specifies the next-hop address on which to enable BFD fast-detection. |
| **bfd fast-detect** | Enables BFD fast-detection on the specified IPV4 unicast destination address prefix and on the forwarding next-hop address. |
| **minimum interval** *interval* | (Optional) Ensures that the next hop is assigned with the same hello interval. Replace *interval* with a number that specifies the interval in milliseconds. Range is from 10 through 10000. |
| **multiplier** *multiplier* | (Optional) Ensures that the next hop is assigned with the same detect multiplier. Replace *multiplier* with a number that specifies the detect multiplier. Range is from 1 through 10. |

## Command Default

*interval*: 100

*multiplier*: 3

## Command Modes

Static route configuration mode

## Command History

| Release | Modification |
|---|---|
| Release 3.7.2 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

If the multiplier is changed using the **bfd multiplier** command, the new parameter is used to update all existing BFD sessions for the protocol (BGP, IS-IS, MPLS-TE, or OSPF).

## Task ID

| Task ID | Operations |
|---|---|
| static | read, write |

## Examples

The following example shows how to enable BFD on a static route. In this example, BFD sessions are established with the next-hop 3.3.3.3 when it becomes reachable.

```
RP/0/RSP0/CPU0:router# configure
RP/0/RSP0/CPU0:router(config)# router static
RP/0/RSP0/CPU0:router (config-static)# address-family ipv4 unicast 2.2.2.0/24 3.3.3.3 bfd
fast-detection
```

## Related Commands

| Command | Description |
|---|---|
| bfd fast-detect, on page 28 | Enables BFD to detect failures in the path between adjacent forwarding engines. |
| show bfd, on page 63 | Displays BFD information for a specific location. |

# bfd

To enter Bidirectional Forwarding Detection (BFD) configuration mode, use the **bfd** command in global configuration mode. To exit BFD configuration mode and return to global configuration mode, use the **no** form of this command.

**bfd**
**no bfd**

## Syntax Description

This command has no keywords or arguments.

## Command Default

No default behavior or values

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| Release 3.7.2 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

When you issue the **bfd** command in global configuration mode, the CLI prompt changes to "config-bfd," indicating that you have entered BFD configuration mode. In the following sample output, the question mark (**?**) online help function displays all the commands available under BFD configuration mode:

```
RP/0/RSP0/CPU0:router(config)# bfd
RP/0/RSP0/CPU0:router(config-bfd)# ?

  commit     Commit the configuration changes to running
  describe   Describe a command without taking real actions
  do         Run an exec command
  echo       Configure BFD echo parameters
  exit       Exit from this submode
  interface  Configure BFD on an interface
  no         Negate a command or set its defaults
  root       Exit to the global
      configuration  mode
  show       Show contents of configuration
```

## Task ID

| Task ID | Operations |
|---|---|
| bgp | read, write |
| ospf | read, write |

| Task ID | Operations |
|---|---|
| isis | read, write |
| mpls-te | read, write |

## Examples

The following example shows how to enter BFD configuration mode:

```
RP/0/RSP0/CPU0:router # configure
RP/0/RSP0/CPU0:router(config)# bfd
RP/0/RSP0/CPU0:router(config-bfd)#
```

## Related Commands

| Command | Description |
|---|---|
| echo disable, on page 46 | Disables echo mode on a router or on an individual interface or bundle. |
| interface (BFD), on page 56 | Enters BFD interface configuration mode, where you can disable echo mode on an interface. |
| show bfd, on page 63 | Displays BFD information for a specific location. |

# bfd address-family ipv4 destination

To specify the destination address for BFD sessions on bundle member links, use the **bfd address-family ipv4 destination** command in interface configuration mode. To return to the default, use the **no** form of this command.

**bfd address-family ipv4 destination** *ip-address*
**no bfd address-family ipv4 destination** *ip-address*

## Syntax Description

| | |
|---|---|
| *ip-address* | 32-bit IPv4 address in dotted-decimal format (A.B.C.D). |

## Command Default

No destination IPv4 address is configured.

## Command Modes

Interface configuration (config-if)

## Command History

| Release | Modification |
|---|---|
| Release 4.0.0 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

This command is supported on bundle interfaces only.

## Task ID

| Task ID | Operations |
|---|---|
| bundle | read, write |

## Examples

The following example specifies the IPv4 address of 10.20.20.1 as the destination address for the BFD session on an Ethernet bundle interface:

```
RP/0/RSP0/CPU0:router# configure
RP/0/RSP0/CPU0:router(config)# interface Bundle-Ether 1
RP/0/RSP0/CPU0:router(config-if)# bfd address-family ipv4 destination 10.20.20.1
```

## Related Commands

| Command | Description |
|---|---|
| bfd address-family ipv4 fast-detect, on page 10 | Enables IPv4 BFD sessions on bundle member links. |

# bfd address-family ipv4 echo minimum-interval

To specify the minimum interval for echo packets on IPv4 BFD sessions on bundle member links, use the **bfd address-family ipv4 echo minimum-interval** command in interface configuration mode. To return to the default, use the **no** form of this command.

**Note** The interface configuration of the echo timer value takes precedence over the global echo timer value.

**bfd address-family ipv4 echo minimum-interval** *milliseconds*
**no bfd address-family ipv4 echo minimum-interval** [*milliseconds*]

## Syntax Description

| | |
|---|---|
| milliseconds | Shortest interval between sending BFD echo packets to a neighbor. The range is 15 to 2000 milliseconds. |

## Command Default

The default value is the product of the async and multiplier values.

## Command Modes

Interface configuration

## Command History

| Release | Modification |
|---|---|
| Release 5.3.0 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

This command is supported on only on BFD over Bundle Per-Member Link Mode using Cisco standard.

This command allows to configure an echo interval to a value greater than async x bfd multiplier value.

## Task ID

| Task ID | Operations |
|---|---|
| bundle | read, write |

## Examples

The following example specifies that echo packets will be sent at a minimum interval of 900 ms for IPv4 BFD sessions on member links of an Ethernet bundle:

```
RP/0/RSP0/CPU0:router# configure
RP/0/RSP0/CPU0:router(config)# interface Bundle-Ether 1
RP/0/RSP0/CPU0:router(config-if)# bfd address-family ipv4 minimum-interval 200
RP/0/RSP0/CPU0:router(config-if)# bfd address-family ipv4 echo minimum-interval
 900
```

**Related Commands**

| Command | Description |
|---|---|
| bfd address-family ipv4 multiplier, on page 14 | Specifies a number that is used as a multiplier with the minimum interval to determine BFD control and echo packet failure detection times and echo packet transmission intervals for IPv4 BFD sessions on bundle member links. |
| bfd address-family ipv4 minimum-interval, on page 11 | Specifies the minimum interval for asynchronous mode control packets on IPv4 BFD sessions on bundle member links. |

# bfd address-family ipv4 fast-detect

To enable IPv4 BFD sessions on bundle member links, use the **bfd address-family ipv4 fast-detect** command in interface configuration mode. To return to the default, use the **no** form of this command.

**bfd address-family ipv4 fast-detect**
**no bfd address-family ipv4 fast-detect**

## Syntax Description

This command has no keywords or arguments.

## Command Default

BFD sessions are disabled.

## Command Modes

Interface configuration (config-if)

## Command History

| Release | Modification |
|---|---|
| Release 4.0.0 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

This command is supported on bundle interfaces only.

## Task ID

| Task ID | Operations |
|---|---|
| bundle | read, write |

## Examples

The following example enables IPv4 BFD sessions on member links of an Ethernet bundle:

```
RP/0/RSP0/CPU0:router# configure
RP/0/RSP0/CPU0:router(config)# interface Bundle-Ether 1
RP/0/RSP0/CPU0:router(config-if)# bfd address-family ipv4 fast-detect
```

## Related Commands

| Command | Description |
|---|---|
| bfd address-family ipv4 destination, on page 7 | Specifies the destination address for BFD sessions on bundle member links. |

# bfd address-family ipv4 minimum-interval

To specify the minimum interval for asynchronous mode control packets on IPv4 BFD sessions on bundle member links, use the **bfd address-family ipv4 minimum-interval** command in interface configuration mode. To return to the default, use the **no** form of this command.

**bfd address-family ipv4 minimum-interval** *milliseconds*
**no bfd address-family ipv4 minimum-interval** [*milliseconds*]

## Syntax Description

| | |
|---|---|
| milliseconds | Shortest interval between sending BFD control packets to a neighbor. The range is 15 to 30000 milliseconds.<br>**Note**<br>Although the command allows you to configure a minimum of 15 ms, the supported minimum is 50 ms. |

## Command Default

The default is 150 ms.

## Command Modes

Interface configuration (config-if)

## Command History

| Release | Modification |
|---|---|
| Release 4.0.0 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

This command is supported on bundle interfaces only.

The BFD minimum interval is used with a configurable multiplier (**bfd address-family ipv4 multiplier** command) to determine the intervals and failure detection times for both control and echo packets in asynchronous mode on bundle member links.

For example, with a session interval of *I* and a multiplier of *M*, the following packet intervals and failure detection times apply for BFD asynchronous mode:

- Value of *I*—Minimum period between sending of BFD control packets.
- Value of *I* x *M*
  - BFD control packet failure detection time. This is the maximum amount of time that can elapse without receipt of a BFD control packet before the session is declared down.
  - Minimum period between sending of BFD echo packets.
- Value of (*I* x *M*) x *M*—BFD echo packet failure detection time. This is the maximum amount of time that can elapse without receipt of a BFD echo packet before the session is declared down.

When used with bundled VLANs, the following restrictions apply:

- The command specifies control packet intervals only because echo packets are not supported.
- The minimum interval is 250 ms.

The **bfd address-family ipv4 minimum-interval** command in bundle interface configuration overrides the minimum intervals specified by the **bfd minimum-interval** command in other areas of BFD configuration.

**Note** When multiple applications share the same BFD session, the application with the most aggressive timer is used locally. Then, the result is negotiated with the peer router.

Keep the following router-specific rules in mind when configuring the minimum BFD interval:

- The maximum rate in packets-per-second (pps) for BFD sessions is linecard-dependent. If you have multiple linecards supporting BFD, then the maximum rate for BFD sessions per system is the supported linecard rate multiplied by the number of linecards.
  - The maximum rate for BFD sessions per linecard is 9600 pps.
- The maximum number of all BFD sessions on the router is 1024.
- The maximum number of all BFD sessions on the router is 1440.

To calculate the rate for BFD sessions on bundle members running in asynchronous mode without echo:

- Divide 1000 by the value of the minimum interval (as specified by the **bfd address-family ipv4 minimum-interval** command). This is also the base rate used per member session with echo:

  Asynchronous rate per bundle member = (1000 / Min-interval)

To calculate the rate for BFD sessions on bundle members running in asynchronous mode with echo:

- Determine the echo interval, which is the value of the minimum interval (specified by the **bfd address-family ipv4 minimum-interval** command) multiplied by the multiplier value (specified by the **bfd address-family ipv4 multiplier** command).

  Echo interval = (Min-interval x Multiplier)

- Calculate the overall rate supported for all members on the bundle:

  Ethernet bundle rate = (1000 / Echo interval) x 64

- Add the asynchronous base rate per bundle member to find the total rate for all bundle links:

  Total bundle rate = Ethernet bundle rate + (Base asynchronous rate x Number of links)

## Task ID

| Task ID | Operations |
|---|---|
| bundle | read, write |

## Examples

The following example specifies that control packets will be sent at a minimum interval of 200 ms for IPv4 BFD sessions on member links of an Ethernet bundle:

```
RP/0/RSP0/CPU0:router# configure
```

```
RP/0/RSP0/CPU0:router(config)# interface Bundle-Ether 1
RP/0/RSP0/CPU0:router(config-if)# bfd address-family ipv4 minimum-interval 200
```

## Related Commands

| Command | Description |
|---|---|
| bfd minimum-interval, on page 31 | Specifies the minimum control packet interval for BFD sessions for the corresponding BFD configuration scope. |
| bfd address-family ipv4 multiplier, on page 14 | Specifies a number that is used as a multiplier with the minimum interval to determine BFD control and echo packet failure detection times and echo packet transmission intervals for IPv4 BFD sessions on bundle member links. |

# bfd address-family ipv4 multiplier

To specify a number that is used as a multiplier with the minimum interval to determine BFD control and echo packet failure detection times and echo packet transmission intervals for IPv4 BFD sessions on bundle member links, use the **bfd address-family ipv4 multiplier** command in interface configuration mode. To return to the default, use the **no** form of this command.

**bfd address-family ipv4 multiplier** *multiplier*
**no bfd address-family ipv4 multiplier** [*multiplier*]

## Syntax Description

*multiplier* Number from 2 to 50.

**Note**
Although the command allows you to configure a minimum of 2, the supported minimum is 3.

## Command Default

The default multiplier is 3.

## Command Modes

Interface configuration (config-if)

## Command History

| Release | Modification |
|---|---|
| Release 4.0.0 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

This command is supported on bundle interfaces only.

The BFD multiplier is used with a configurable minimum interval (**bfd address-family ipv4 minimum-interval** command) to determine the intervals and failure detection times for both control and echo packets in asynchronous mode on bundle member links.

For example, with a session interval of *I* and a multiplier of *M*, the following packet intervals and failure detection times apply for BFD asynchronous mode:

- Value of *I*—Minimum period between sending of BFD control packets.
- Value of *I* x *M*
  - BFD control packet failure detection time. This is the maximum amount of time that can elapse without receipt of a BFD control packet before the session is declared down.
  - Minimum period between sending of BFD echo packets.



**Note** The maximum echo packet interval for BFD on bundle member links is the minimum of either 30 seconds or the asynchronous control packet failure detection time.

- Value of (*I* x *M*) x *M*—BFD echo packet failure detection time. This is the maximum amount of time that can elapse without receipt of a BFD echo packet before the session is declared down.

Keep the following router-specific rules in mind when configuring the minimum BFD interval:

- The maximum rate in packets-per-second (pps) for BFD sessions is linecard-dependent. If you have multiple linecards supporting BFD, then the maximum rate for BFD sessions per system is the supported linecard rate multiplied by the number of linecards.
  - The maximum rate for BFD sessions per linecard is 9600 pps.
- The maximum number of all BFD sessions per linecard is 1024.
- The maximum number of all BFD sessions per linecard is 1440.

To calculate the rate for BFD sessions on bundle members running in asynchronous mode without echo:

- Divide 1000 by the value of the minimum interval (as specified by the **bfd address-family ipv4 minimum-interval** command). This is also the base rate used per member session with echo:

  Asynchronous rate per bundle member = (1000 / Min-interval)

To calculate the rate for BFD sessions on bundle members running in asynchronous mode with echo:

- Determine the echo interval, which is the value of the minimum interval (specified by the **bfd address-family ipv4 minimum-interval** command) multiplied by the multiplier value (specified by the **bfd address-family ipv4 multiplier** command).

  Echo interval = (Min-interval x Multiplier)

- Calculate the overall rate supported for all members on the bundle:

  Ethernet bundle rate = (1000 / Echo interval) x 64

- Add the asynchronous base rate per bundle member to find the total rate for all bundle links:

  Total bundle rate = Ethernet bundle rate + (Base asynchronous rate x Number of links)

## Task ID

| Task ID | Operations |
|---|---|
| bundle | read, write |

## Task ID Examples

The following example specifies the following packet intervals and failure detection times for IPv4 BFD sessions on member links with asynchronous echo mode on an Ethernet bundle:

- 200 ms control packet interval
- 600 ms control packet failure detection interval
- 600 ms echo packet interval
- 1800 ms echo packet failure detection interval

```
RP/0/RSP0/CPU0:router# configure
RP/0/RSP0/CPU0:router(config)# interface Bundle-Ether 1
```

```
RP/0/RSP0/CPU0:router(config-if)# bfd address-family ipv4 minimum-interval 200
RP/0/RSP0/CPU0:router(config-if)# bfd address-family ipv4 multiplier 3
```

## Related Commands

| Command | Description |
|---|---|
| bfd address-family ipv4 minimum-interval, on page 11 | Specifies the minimum interval for asynchronous mode control packets on IPv4 BFD sessions on bundle member links. |
| bfd minimum-interval, on page 31 | Specifies the minimum control packet interval for BFD sessions for the corresponding BFD configuration scope. |

# bfd address-family ipv4 timers

To configure timers to allow for delays in receipt of BFD state change notifications (SCNs) from peers before declaring a link bundle BFD session down for IPv4 BFD sessions on bundle member links, use the **bfd address-family ipv4 timers** command in interface configuration mode. To return to the default, use the **no** form of this command.

**Note** BFD session flaps when the **show tech-support { bfd | cef | spp }** command is executed on the system with 30 millisecond timer configured. This occurs only when Cisco ASR 9000 Series Ethernet Line Card is installed in the system.

**bfd address-family ipv4 timers** [**start** | **nbr-unconfig**] *seconds*
**no bfd address-family ipv4 timers** [**start** | **nbr-unconfig**] *seconds*

## Syntax Description

| | |
|---|---|
| **start** *seconds* | Number of seconds after startup of a BFD member link session to wait for the expected notification from the BFD peer to be received, so that the session can be declared up. If the SCN is not received after that period of time, the BFD session is declared down. The range is 60 to 3600.<br>**Note**<br>In Cisco IOS XR Releases 4.0 and 4.0.1, the available minimum is 30, but is not recommended. |
| **nbr-unconfig** *seconds* | Number of seconds to wait after receipt of notification that the BFD configuration has been removed by a BFD neighbor, so that any configuration inconsistency between the BFD peers can be fixed. If the BFD configuration issue is not resolved before the specified timer is reached, the BFD session is declared down. The range is 60 to 3600.<br>**Note**<br>In Cisco IOS XR Releases 4.0 and 4.0.1, the available minimum is 30, but is not recommended. |

## Command Default

No timers are configured.

## Command Modes

Interface configuration (config-if)

## Command History

| Release | Modification |
|---|---|
| Release 4.0.0 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

This command is supported on bundle interfaces only.

## Task ID

| Task ID | Operations |
|---|---|
| bundle | read, write |

## Examples

The following example configures a timer for members of the specified Ethernet bundle that allows up to 1 minute (60 seconds) after startup of a BFD member link session to wait for receipt of the expected notification from the BFD peer to declare the session up:

```
RP/0/RSP0/CPU0:router# configure
RP/0/RSP0/CPU0:router(config)# interface Bundle-Ether 1
RP/0/RSP0/CPU0:router(config-if)# bfd address-family ipv4 timers start 60
```

The following example configures a timer for members of the specified Ethernet bundle that allows up to 1 minute (60 seconds) to wait after receipt of notification that the BFD configuration has been removed by a BFD neighbor, before declaring a BFD session down:

```
RP/0/RSP0/CPU0:router# configure
RP/0/RSP0/CPU0:router(config)# interface Bundle-Ether 1
RP/0/RSP0/CPU0:router(config-if)# bfd address-family ipv4 timers nbr-unconfig 60
```

# bundle coexistence bob-blb

To configure a coexistence mechanism between BFD over Bundle (BoB) and BFD over Logical Bundle (BLB), use the **bundle coexistence bob-blb** command in BFD configuration mode. To disable this feature use the **no** form of this command.

**bundle coexistence bob-blb** {**inherit** | **logical**}
**no bundle coexistence bob-blb** {**inherit** | **logical**}

## Syntax Description

| | |
|---|---|
| **inherit** | Specifies inheritance as the coexistence mechanism. |
| **logical** | Specifies to use BFD logical bundle natively for coexistence. |

## Command Default

No coexistence configuration is enabled. The BLB configuration behaves the same as the BVLAN configuration.

## Command Modes

BFD configuration

## Command History

| Release | Modification |
|---|---|
| Release 4.3.0 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

The default behavior for BLB without any coexistence configuration behaves exactly as the BVLAN configuration.

When the "inherited" coexistence mode is configured, the BLB session always uses the inherited mode. It always creates a virtual session, and never a BFD session with real packets. This mode prevents the automatic conversion between BLB and the inherited mode, which could happen in default mode, depending on the sequence in which the configuration is applied. The "inherited" session is in "Down" state when BoB is not enabled.

The "logical" mode always creates BFD session with real packets.

## Task ID

| Task ID | Operation |
|---|---|
| bgp | read, write |
| ospf | read, write |
| isis | read, write |
| mpls-te | read, write |

This example shows how to configure the coexistence mechanism between BFD over Bundle (BoB) and BFD over Logical Bundle (BLB) as being "inherited":

```
RP/0/RSP0/CPU0:router#configure
RP/0/RSP0/CPU0:router(config)#bfd
RP/0/RSP0/CPU0:router(config-bfd)#bundle coexistence bob-blb inherit
```

This example shows how to configure the coexitence mechanism between BFD over Bundle (BoB) and BFD over Logical Bundle (BLB) as being "logical":

```
RP/0/RSP0/CPU0:router#configure
RP/0/RSP0/CPU0:router(config)#bfd
RP/0/RSP0/CPU0:router(config-bfd)#bundle coexistence bob-blb logical
```

# bfd dampening

To configure a device to dampen a flapping Bidirectional Forwarding Detection (BFD) session, use the **bfd dampening** command in global configuration mode. To restore the values of the dampening timers to their default values, use the **no** form of this command.

**bfd dampening** [**bundle-member**] {**initial-wait** | **l3-only-mode** | **maximum-wait** | **secondary-wait** | **extension down-monitoring** | **threshold**} *milliseconds*
**no bfd dampening** [**bundle-member**] {**initial-wait** | **l3-only-mode** | **maximum-wait** | **secondary-wait** | **extension down-monitoring** | **threshold**} *milliseconds*

## Syntax Description

| | |
|---|---|
| **bundle-member** | Specifies initial, maximum, or secondary delays in milliseconds for BFD session startup on BFD bundle members. |
| **initial-wait** | Specifies the initial delay in milliseconds before starting a BFD session. For bundle members, the default is 16000. For non-bundle interfaces, the default is 2000. |
| **l3-only-mode** | Applies dampening, if the failure is Layer 3 (L3)-specific. |
| **maximum-wait** | Specifies the maximum delay in milliseconds before starting a BFD session.<br>**Note** The maximum delay must be greater than the initial delay. |
| **secondary-wait** | Specifies a secondary delay in milliseconds before starting a BFD session. For bundle members, the default is 20000. For non-bundle interfaces, the default is 5000. |
| **extensions down-monitoring** | Enables session monitoring extensions in down state. |
| **threshold** | Specifies a stability threshold to enable dampening in milliseconds. Range 6000 to 360000. The default is 120000. |
| *milliseconds* | For bundle members, the range is 1-518400000. For non-bundle interfaces, the range is 1-3600000. |

**Command Default** BFD dampening is enabled by default.

**Command Modes** Global configuration

**Command History**

| Release | Modification |
|---|---|
| Release 3.9.0 | This command was introduced. |
| Release 4.0.0 | The **bundle-member** keyword was added. |
| Release 4.2.0 | The **l3-only-mode** keyword was added to the other dampening options. |
| Release 5.1 | The **extensions** and **down-monitoring** keywords were added. |

**Usage Guidelines** To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

**Note** The **initial-wait**, **maximum-wait**, and **secondary-wait** keywords are dampening timers.

You do not have to configure the BFD startup timers. If you do configure the initial wait startup timer (using the **initial-wait** keyword), then it must be less than the value of the maximum-wait timer.

By default, BFD dampening is applied to all sessions in the following manner:

- If a session is brought down, then dampening is applied before a session is allowed to transition to initial/up states.
- Length of time a session is dampened grows exponentially with continuous session flap.
- If a session remains up for minimum two minutes, then the length of time a session dampens with the next session flap is reset to the initial dampening value.

BFD on bundle member applies dampening, only if the detected failure is specific to layer 3. BFD dampening is not invoked for L1 or L2 failures. BFD is started after Layer 1 and Layer 2 (LACP) is up to prevent a race condition and false triggers. BFD is notified to stop/ignore when L1 or L2 goes down and must be notified to start/resume when L1 or L2 recovers for a given/affected link/member.

BFD applies dampening till the session transitions from up to down state and the session is not removed. Whenever there is a failure detected at L1 or L2 , the bundle manager removes BFD session on a member.

When dampening is removed a syslog message ‘Exponential backoff dampening for BFD session has been cleared for specified BFD session. When/if same session gets created by application(s), only calculated initial wait time will be applied’ is generated. If this is the desired behavior, then dampening can be enabled by configuring the BFD configuration, by using the command **bfd dampening bundle-member l3-failure-only**.

**Task ID**

| Task ID | Operation |
|---|---|
| bgp | read, write |
| ospf | read, write |

| Task ID | Operation |
|---|---|
| isis | read, write |
| mpls-te | read, write |

This example shows how to configure BFD dampening by specifying an initial and maximum delay for BFD session startup on BFD bundle members:

```
RP/0/RSP0/CPU0:router# configure
RP/0/RSP0/CPU0:router(config)# bfd dampening bundle-member initial-wait 1000
RP/0/RSP0/CPU0:router(config)# bfd dampening bundle-member maximum-wait 3000
```

This example shows how to configure BFD dampening on a non-bundle interface:

```
RP/0/RSP0/CPU0:router# configure
RP/0/RSP0/CPU0:router(config)# bfd dampening initial-wait 1000
RP/0/RSP0/CPU0:router(config)# bfd dampening maximum-wait 3000
```

# bfd dampening disable

To disable a device from dampening a flapping Bidirectional Forwarding Detection (BFD) session, use the **bfd dampening disable** command in global configuration mode. To revoke the dampening of a flapping BFD session **no** form of this command.

**bfd dampening disable**
**no bfd dampening disable**

## Syntax Description

This command has no arguments or keywords.

## Command Default

BFD dampening is enabled by default.

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| Release 6.1.x | This command was introduced. |

## Task ID

| Task ID | Operation |
|---|---|
| bgp | read, write |
| ospf | read, write |
| isis | read, write |
| mpls-te | read, write |

This example shows how to disable BFD dampening

```
RP/0/RSP0/CPU0:router# configure
RP/0/RSP0/CPU0:router(config)# bfd dampening disable
```

# bfd echo ipv4 bundle-per-member minimum-interval

To globally specify the minimum global interface configuration mode. To return to the default, use the **no** form of this command.

**bfd echo ipv4 bundle-per-member minimum-interval** *milliseconds*
**bfd echo ipv4 bundle-per-member minimum-interval** [*milliseconds*]

## Syntax Description

| | |
|---|---|
| milliseconds | Shortest interval between sending BFD echo packets to a neighbor. The range is 15 to 2000 milliseconds. |

## Command Default

The default value is the product of the async and multiplier values.

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| Release 5.3.0 | This command was introduced. |

## Usage Guidelines

This command allows you to globally configure an echo interval to a value greater than async*bfd multiplier value. When the value of echo configured is lesser than the I*M1, where I is the Minimum period between sending of BFD Async packets and M1 is the remote multiplier, then the echo value is taken as I*M1 and echo detection time is taken as I*M1*M2 where M2 is the local Multiplier.

This command is supported on only on BFD over Bundle Per-Member Link mode using Cisco standard.

## Task ID

| Task ID | Operations |
|---|---|
| bundle | read, write |

## Examples

The following example specifies that echo packets will be sent globally at a minimum interval of 500 ms for IPv4 BFD sessions on bundle member links:

```
RP/0/RSP0/CPU0:router# configure
RP/0/RSP0/CPU0:router(config)#  bfd echo ipv4 bundle-per-member minimum-interval
 500
```

## Related Commands

| Command | Description |
|---|---|
| bfd address-family ipv4 multiplier, on page 14 | Specifies a number that is used as a multiplier with the minimum interval to determine BFD control and echo packet failure detection times and echo packet transmission intervals for IPv4 BFD sessions on bundle member links. |

| Command | Description |
| --- | --- |
| bfd address-family ipv4 minimum-interval, on page 11 | Specifies the minimum interval for asynchronous mode control packets on IPv4 BFD sessions on bundle member links. |
| bfd address-family ipv4 echo minimum-interval, on page 8 | Specifies the minimum interval for asynchronous mode control packets on IPv4 BFD sessions on bundle member links. |

# bfd encap-mode

To enable continuity check for MPLS LSPs via BFD over Generic Associated Channel Label (GAL) (Label 13), use the **bfd encap-mode** command in MPLS Traffic Engineering Tunnel (TE) interface configuration mode. To disable continuity check for MPLS LSPs via BFD running over GAL channel, use the **no** form of this command.

**bfd encap-mode gal**

**no bfd encap-mode gal**

## Syntax Description

| | |
|---|---|
| **gal** | Specifies the use of BFD over Generic Associated Channel Label (GAL) (Label 13) for MPLS LSPs. |

## Command Default

No default behavior or values.

## Command Modes

MPLS TE Tunnel interface configuration

## Command History

| Release | Modification |
|---|---|
| Release 5.2.0 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

By default, BFD is enabled over an IP channel. This command enables BFD over GAL channel.

**Note** BFD over Generic Associated Channel Label (GAL) is not supported on virtual interfaces.

## Task ID

| Task ID | Operations |
|---|---|
| mpls-te | read, write |

## Examples

This example shows how to enable continuity check for MPLS LSPs via BFD over GAL channel:

```
RP/0/RSP0/CPU0:router# configure
RP/0/RSP0/CPU0:router(config)# interface tunnel-te 1
RP/0/RSP0/CPU0:router(config-if)# bfd
RP/0/RSP0/CPU0:router(config-if-tunte-bfd)# encap-mode gal
```

# bfd fast-detect

To enable Bidirectional Forwarding Detection (BFD) to detect failures in the path between adjacent forwarding engines, use the **bfd fast-detect** command in the appropriate configuration mode. To return the software to the default state in which BFD is not enabled, use the **no** form of this command.

**bfd fast-detect** [**disable** | **ipv4**]
**no bfd fast-detect**

## Syntax Description

**disable** Disables the detection of failures in the path between adjacent forwarding engines for a specified entity, such as a BGP neighbor or OSPF interface.

**Note**
The **disable** keyword is available in the following modes only: BGP configuration, OSPF area configuration, OSPF area interface configuration, OSPFv3 area configuration, and OSPFv3 area interface configuration .

**ipv4** Enables Intermediate System-to-Intermediate System (IS-IS) BFD detection of failures in the path between adjacent forwarding engines.

**Note**
The **ipv4** keyword is available in IS-IS router configuration mode only.

## Command Default

BFD detection of failures in the path between adjacent forwarding engines is disabled.

## Command Modes

Neighbor configuration

Session group configuration

Neighbor group configuration

Interface configuration

Interface configuration

Router configuration

Area configuration

Area interface configuration

Router configuration

Area configuration

Area interface configuration

Interface configuration

## Command History

| Release | Modification |
|---|---|
| Release 3.7.2 | This command was introduced. |

| Release | Modification |
|---|---|
| Release 4.0.0 | The **bfd fast-detect** command was supported in the following modes: OSPFv3 router configuration, OSPFv3 area configuration, and OSPFv3 area interface configuration. |

## Usage Guidelines

**Note** BFD can support multihop for internal and external BGP peers.

Use the **bfd fast-detect** command to provide protocol- and media-independent, short-duration failure detection of the path between adjacent forwarding engines, including the interfaces and data links.

BFD must be configured on directly connected neighbors for a BFD session to be established between the neighbors.

When MPLS-TE tunnels are protected by backup tunnels, BFD failure triggers fast reroute on affected tunnels.

In OSPF and OSPFv3 environments, the setting of the **bfd fast-detect** command is inherited from the highest-level configuration mode in which the command was configured. From the lowest to the highest configuration modes, the inheritance rules are as follows:

- If you enable BFD in area interface configuration mode, it is enabled on the specified interface only.
- If you enable BFD in area configuration mode, it is enabled on all interfaces in the specified area.
- If you enable BFD in router configuration mode, it is enabled on all areas and all associated interfaces in the specified routing process.

The **disable** keyword is available in the following modes: BGP configuration, OSPF area configuration, OSPF area interface configuration, OSPFv3 area configuration, and OSPFv3 area interface configuration . In OSPF and OSPFv3 environments, the **disable** option enables you to override the inheritance rules described previously. For example, if you enable BFD in an OSPF area, BFD is enabled on all interfaces in that area. If you do not want BFD running on one of the interfaces in that area, you must specify the **bfd fast-detect disable** command for that interface only.

To disable BFD or return the software to the default state in which BFD is not enabled in IS-IS router configuration mode and MPLS-TE configuration mode, you must enter the **no bfd fast-detect** command.

## Task ID

| Task ID | Operations |
|---|---|
| bgp | read, write |
| isis | read, write |
| mpls-te | read, write |
| ospf | read, write |
| multicast | read, write |

## Examples

The following example shows how to configure BFD on a BGP router:

```
RP/0/RSP0/CPU0:router# configure
RP/0/RSP0/CPU0:router(config)# router bgp 65000
RP/0/RSP0/CPU0:router(config-bgp)# neighbor 192.168.70.24
RP/0/RSP0/CPU0:router(config-bgp-nbr)# remote-as 2
RP/0/RSP0/CPU0:router(config-bgp-nbr)# bfd fast-detect
```

The following example shows the configuration of an OSPFv3 routing process named san_jose. The example shows two areas, each of which includes Gigabit Ethernet interfaces. In area 0, BFD is enabled at the area level, which means that by virtue of the inheritance rules, BFD is enabled on all interfaces within the area except those on which BFD is explicitly disabled. Given this rule, BFD is enabled on Gigabit Ethernet interfaces 1/0/0/0 and 2/0/0/0 and is disabled on interface 3/0/0/0.

In area 1, BFD is enabled on Gigabit Ethernet interface 5/0/0/0 only. Because BFD is not enabled at the area level nor explicitly enabled on interface 4/0/0/0, it is disabled on this interface.

```
router ospfv3 san_jose
    area 0
        bfd fast-detect
        ...
        int gige 1/0/0/0
        !
        int gige 2/0/0/0
            ...
int gige 3/0/0/0
            bfd fast-detect disable
!
    !
    area 1
        int gige 4/0/0/0
        !
        int gige 5/0/0/0
            bfd fast-detect
        !
    !
```

## Related Commands

| Command | Description |
|---|---|
| address-family ipv4 unicast (BFD), on page 3 | Enables BFD fast-detection on a specific IPV4 unicast destination address prefix and on the forwarding next-hop address. |
| bfd minimum-interval, on page 31 | Specifies the minimum control packet interval for BFD sessions for the corresponding BFD configuration scope. |
| bfd multiplier, on page 38 | Sets the BFD multiplier. |
| show bfd, on page 63 | Displays BFD information for a specific location. |

# bfd minimum-interval

To specify the minimum control packet interval for BFD sessions for the corresponding BFD configuration scope, use the **bfd minimum-interval** command in the appropriate configuration mode. To return the router to the default setting, use the **no** form of this command.

**bfd minimum-interval** *milliseconds*
**no bfd minimum-interval** [*milliseconds*]

## Syntax Description

| | |
|---|---|
| *milliseconds* | Interval between sending BFD hello packets to the neighbor. The range is 15 to 30000 milliseconds. For MPLS-TE, the range is 15 to 200 milliseconds. For GRE tunnel, the range is 150 to 30000 milliseconds. The default is 150 milliseconds. |

## Command Default

BGP *interval*: 50 milliseconds

IS-IS *interval*: 150 milliseconds

OSPF and OSPFv3 *interval*: 150 milliseconds

MPLS-TE *interval*: 15 milliseconds

PIM *interval*: 150 milliseconds

## Command Modes

Router configuration

Interface configuration

MPLS TE configuration

Router configuration

Area configuration

Area interface configuration

Router configuration

Area configuration

Interface configuration

Tunnel configuration

## Command History

| Release | Modification |
|---|---|
| Release 3.7.2 | This command was introduced. |
| Release 4.0.0 | The **bfd minimum-interval** command was supported in the following modes: OSPFv3 router configuration, OSPFv3 area configuration, and OSPFv3 area interface configuration. |
| Release 6.5.1 | The **bfd minimum-interval** command was supported in the tunnel configuration mode. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

In OSPF and OSPFv3 environments, the setting of the **bfd minimum-interval** command is inherited from the highest-level configuration mode in which the command was configured. From the lowest to the highest configuration modes, the inheritance rules are as follows:

- If you configure the minimum interval in area interface configuration mode, the updated interval affects the BFD sessions on the specified interface only.
- If you configure the minimum interval in area configuration mode, the updated interval affects the BFD sessions on all interfaces in the specified area.
- If you configure the minimum interval in router configuration mode, the updated interval affects the BFD sessions in all areas and all associated interfaces in the specified routing process.

If desired, you can override these inheritance rules by explicitly configuring the **bfd minimum-interval** command for a specific area interface or area.



**Note** When multiple applications share the same BFD session, the application with the most aggressive timer wins locally. Then, the result is negotiated with the peer router.

Keep the following router-specific rules in mind when configuring the minimum BFD interval:

- The maximum rate in packets-per-second (pps) for BFD sessions is linecard-dependent. If you have multiple linecards supporting BFD, then the maximum rate for BFD sessions per system is the supported linecard rate multiplied by the number of linecards.

  The maximum rate for BFD sessions per linecard is 9600 pps.
- If a session is running in asynchronous mode without echo, then PPS used for this session is (1000 / asynchronous interval in milliseconds).
- If a session is running in asynchronous mode with echo, then PPS used for this session is (1000 / echo interval in milliseconds).

  This is calculated as: 1000 / value of the **bfd minimum-interval** command.



**Note** The rate for BFD sessions on bundle member links is calculated differently. For more information, see the **bfd address-family ipv4 minimum-interval** command.

- The maximum number of all BFD sessions per linecard is 1024.
- The maximum number of all BFD sessions per linecard is 1440.
- When asynchronous mode is available, the minimum interval must be greater than or equal to 15 milliseconds for up to 100 sessions on the line card. If you are running the maximum of 1024 sessions, the failure detection interval must be greater than or equal to 150 milliseconds.
- When asynchronous mode is available, the minimum interval must be greater than or equal to 250 milliseconds, with a multiplier of 3 for up to 100 sessions per line card.

- When asynchronous mode is available, the minimum interval must be greater than or equal to 15 milliseconds for up to 100 sessions on the line card. If you are running the maximum of 1440 sessions, the failure detection interval must be greater than or equal to 150 milliseconds.
- When echo mode is available, the minimum interval must be greater than or equal to 15 milliseconds for up to 100 sessions on the line card. If you are running the maximum of 1024 sessions, the failure detection interval must be less than or equal to 150 milliseconds.
- When echo mode is available, the minimum interval must be 50 milliseconds with a multiplier of 3.
- When echo mode is available, the minimum interval must be greater than or equal to 15 milliseconds for up to 100 sessions on the line card. If you are running the maximum of 1440 sessions, the failure detection interval must be less than or equal to 150 milliseconds.

## Task ID

| Task ID | Operations |
|---|---|
| bgp | read, write |
| isis | read, write |
| mpls-te | read, write |
| ospf | read, write |
| multicast | read, write |

## Examples

The following example shows how to set the BFD minimum interval for a BGP routing process:

```
RP/0/RSP0/CPU0:router(config)# router bgp 6500
RP/0/RSP0/CPU0:router(config-bgp)# bfd minimum-interval 275
```

The following example shows the configuration of an OSPFv3 routing process named san_jose. The example shows two areas, each of which includes Gigabit Ethernet interfaces. In area 0, the minimum interval is set to 200 at the area level, which means that by virtue of the inheritance rules, the same value is set on all interfaces within the area except those on which a different value is explicitly configured. Given this rule, Gigabit Ethernet interface 1/0/0/0 uses the interval of 200, which is inherited from the area, while interface 2/0/0/0 uses the explicitly configured value of 300.

In area 1, the minimum interval is not configured at the area or interface levels, which means that interfaces 3/0/0/0 and 4/0/0/0 use the default interval of 150.

```
router ospfv3 san_jose
bfd fast-detect
    area 0
bfd minimum-interval 200
int gige 1/0/0/0
        !
int gige 2/0/0/0
```

```
bfd minimum-interval 300
        !
    !
    area 1
int gige 3/0/0/0
        !
int gige 4/0/0/0
!
    !
```

## Related Commands

| Command | Description |
|---|---|
| address-family ipv4 unicast (BFD), on page 3 | Enables BFD fast-detection on a specific IPV4 unicast destination address prefix and on the forwarding next-hop address. |
| bfd fast-detect, on page 28 | Enables BFD to detect failures in the path between adjacent forwarding engines. |
| bfd multiplier, on page 38 | Sets the BFD multiplier. |
| show bfd, on page 63 | Displays BFD information for a specific location. |

# bfd mode

To enable the option to use Cisco or IETF mode for BFD over bundle, use the **bfd mode** command in interface configuration mode. To disable the option to use Cisco or IETF mode for BFD over bundle, use the **no** form of this command.

**bfd mode** {**cisco** | **ietf**}

**no bfd mode**

## Syntax Description

| | |
|---|---|
| **cisco** | Specifies the use of Cisco mode for BFD over bundle. |
| **ietf** | Specifies the use of IETF mode for BFD over bundle. |

## Command Default

The default member mode is **cisco**.

## Command Modes

Interface configuration (config-if)

## Command History

| Release | Modification |
|---|---|
| Release 5.3.1 | This command was introduced. |

## Usage Guidelines

If the BFD mode is configured when the bundle is being created, the configuration goes through. This is because, both the BFD state as well as the bundle state are 'down' during bundle creation. To apply the mode change for existing sessions, bring down and then recreate the BFD sessions for that bundle.

A BFD session on the member interfaces can belong to only one mode (Cisco or IETF mode). Mix of the modes within the same bundle is not supported. This command is supported on bundle interfaces only.

## Task ID

| Task ID | Operations |
|---|---|
| bundle | read, write |

## Examples

This example shows how to enable **ietf** mode for the BFD session on an Ethernet bundle interface:

```
RP/0/RSP0/CPU0:router# configure
RP/0/RSP0/CPU0:router(config)#  interface bundle-ether 1
RP/0/RSP0/CPU0:router(config-if)#   bfd mode ietf
```

# bfd multipath include location

To include specific linecards to host BFD multiple path sessions, use the **bfd multipath include location** command in the global configuration mode. To remove the configuration, use the **no** form of this command.

**bfd multipath include location** *node-id*
**no bfd multipath include location** *node-id*

## Syntax Description

| | |
|---|---|
| **location** *node-id* | Configures BFD multipath on the specified location. The *node-id* variable is mentioned in the *rack/slot/module* notation. |

## Command Default

No default behavior or values

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| Release 4.2.0 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

## Task ID

| Task ID | Operation |
|---|---|
| bgp | read, write |
| ospf | read, write |
| isis | read, write |
| mpls-te | read, write |

### Example

This example shows how to run the **bfd multipath include location** command on a specific location:

```
RP/0/RSP0/CPU0:router# configure
RP/0/RSP0/CPU0:router(config)# bfd multipath include location 0/5/CPU0
```

## Related Commands

| Command | Description |
|---|---|
| bfd, on page 5 | Enters BFD configuration mode. |
| show bfd multipath, on page 76 | Displays information regarding BFD multipath sessions. |

# bfd multiplier

To set the Bidirectional Forwarding Detection (BFD) multiplier, use the **bfd multiplier** command in the appropriate configuration mode. To return the router to the default setting, use the **no** form of this command.

**bfd multiplier** *multiplier*
**no bfd multiplier** [*multiplier*]

## Syntax Description

*multiplier* Number of times a packet is missed before BFD declares the neighbor down. The ranges are as follows:

- BGP—2 to 16
- IS-IS—2 to 50
- MPLS-TE—2 to 10
- OSPF and OSPFv3—2 to 50
- PIM—2 to 50
- GRE tunnel—3 to 50

## Command Default

The default multiplier is 3.

## Command Modes

Router configuration

Interface configuration

MPLS-TE configuration

Router configuration

Area configuration

Area interface configuration

Router configuration

Area configuration

Area interface configuration

Interface configuration

Tunnel configuration

## Command History

| Release | Modification |
|---|---|
| Release 3.7.2 | This command was introduced. |
| Release 4.0.0 | The **bfd multiplier** command was supported in the following modes: OSPFv3 router configuration, OSPFv3 area configuration, and OSPFv3 area interface configuration. |

| Release | Modification |
|---|---|
| Release 6.5.1 | The **bfd multiplier** command was supported in tunnel configuration mode. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

In OSPF and OSPFv3 environments, the setting of the **bfd multiplier** command is inherited from the highest-level configuration mode in which the command was configured. From the lowest to the highest configuration modes, the inheritance rules are as follows:

- If you configure a multiplier in area interface configuration mode, the updated multiplier affects the BFD sessions on the specified interface only.
- If you configure a multiplier in area configuration mode, the updated multiplier affects the BFD sessions on all interfaces in the specified area.
- If you configure a multiplier in router configuration mode, the updated multiplier affects the BFD sessions in all areas and all associated interfaces in the specified routing process.

If desired, you can override these inheritance rules by explicitly configuring the **bfd multiplier** command for a specific area interface or area.

If the multiplier is changed using the **bfd multiplier** command, the new value is used to update all existing BFD sessions for the protocol (BGP, IS-IS, MPLS-TE, OSPF, or OSPFv3) .

## Task ID

| Task ID | Operations |
|---|---|
| bgp | read, write |
| isis | read, write |
| mpls-te | read, write |
| ospf | read, write |
| multicast | read, write |

## Examples

The following example shows how to set the BFD multiplier in a BGP routing process:

```
RP/0/RSP0/CPU0:router(config)# router bgp 65000
RP/0/RSP0/CPU0:router(config-bgp)# bfd multiplier 2
```

The following example shows the configuration of an OSPFv3 routing process named san_jose. The example shows two areas, each of which includes Gigabit Ethernet interfaces. In area 0, the multiplier is set to 5 at the area level, which means that by virtue of the inheritance rules, the same value is set

on all interfaces within the area except those on which a different value is explicitly configured. Given this rule, Gigabit Ethernet interface 1/0/0/0 uses a multiplier of 5, which is inherited from the area, while interface 2/0/0/0 uses the explicitly configured multiplier of 2.

In area 1, a multiplier is not configured at the area or interface levels, which means that interfaces 3/0/0/0 and 4/0/0/0 use the default value of 3.

```
router ospfv3 san_jose
bfd fast-detect
    area 0
bfd multiplier 5
int gige 1/0/0/0
        !
int gige 2/0/0/0
bfd multiplier 2
        !
    !
    area 1
int gige 3/0/0/0
        !
int gige 4/0/0/0
!
    !
```

## Related Commands

| Command | Description |
|---|---|
| address-family ipv4 unicast (BFD), on page 3 | Enables BFD fast-detection on a specific IPV4 unicast destination address prefix and on the forwarding next-hop address. |
| bfd fast-detect, on page 28 | Enables BFD to detect failures in the path between adjacent forwarding engines. |
| bfd minimum-interval, on page 31 | Specifies the minimum control packet interval for BFD sessions for the corresponding BFD configuration scope. |
| show bfd, on page 63 | Displays BFD information for a specific location. |

# bfd bundle per-member mode

To enable the option to use Cisco or IETF mode for BFD over per-bundle member link, use the **bfd bundle per-member mode** command in router configuration mode. To disable the option to use Cisco or IETF mode for BFD over per-bundle member link, use the **no** form of this command.

**bfd bundle per-member mode** {**cisco** | **ietf**}

**no bfd bundle per-member mode** {**cisco** | **ietf**}

## Syntax Description

| | |
|---|---|
| **cisco** | Specifies the use of Cisco mode for BFD over per-bundle member link. |
| **ietf** | Specifies the use of IETF mode for BFD over per-bundle member link. |

## Command Default

The default member mode is **cisco**.

## Command Modes

Router configuration

## Command History

| Release | Modification |
|---|---|
| Release 5.2.0 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

The mode change is applied only for new sessions. To apply mode change for existing sessions, delete and then recreate the sessions.

A BFD session on the member interfaces can belong to only one mode (Cisco or IETF mode). Mix of the modes within the same bundle is not supported.

## Task ID

| Task ID | Operations |
|---|---|
| bfd | read, write |

## Examples

This example shows how to enable **cisco** mode for BFD over per-bundle member link:

```
RP/0/RSP0/CPU0:router# configure
RP/0/RSP0/CPU0:router(config)# bfd bundle per-member mode cisco
```

# clear bfd counters

To clear Bidirectional Forwarding Detection (BFD) counters, use the **clear bfd counters** command in EXEC mode.

**clear bfd counters** {**ipv4** | [**singlehop** | **multihop**] | **ipv6** | [**singlehop** | **multihop**] | **all** | **label**} [**packet**] [**timing**] [**interface** *type interface-path-id*] **location** *node-id*

## Syntax Description

| | |
|---|---|
| **ipv4** | (Optional) Clears BFD over IPv4 information only. |
| **ipv6** | (Optional) Clears BFD over IPv6 information only. |
| **singlehop** | (Optional) Clears BFD singlehop information only. |
| **multihop** | (Optional) Clears BFD multihop information only. |
| **all** | (Optional) Clears both BFD over IPv4 and BFD over IPv6 information. |
| **packet** | (Optional) Specifies that packet counters are cleared. |
| **timing** | (Optional) Specifies that timing counters are cleared. |
| **interface** | (Optional) Specifies the interface from which the BFD packet counters are cleared. |
| *type* | Specifies the interface type. For more information, use the question mark ( **?** ) online help function. |
| *interface-path-id* | Physical interface or virtual interface.<br>**Note** Use the **show interfaces** command to see a list of all interfaces currently configured on the router.<br>For more information about the syntax for the router, use the question mark ( **?** ) online help function. |
| **location** *node-id* | Clears BFD counters from the specified location. The *node-id* argument is entered in the *rack/slot/module* notation. |

## Command Default

The default is the default address family identifier (AFI) that is set by the **set default-afi** command, IPv4 or IPv6.

## Command Modes

EXEC

## Command History

| Release | Modification |
|---|---|
| Release 3.7.2 | This command was introduced. |
| Release 4.0.0 | Support for the **ipv6** keyword was added. |
| Release 4.2.0 | Support for the singlehop and multihop keywords were added. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

For the *interface-path-id* argument, use the following guidelines:

- If specifying a physical interface, the naming notation is *rack*/*slot*/*module*/*port*. The slash between values is required as part of the notation. An explanation of each component of the naming notation is as follows:
  - *rack*: Chassis number of the rack.
  - *slot*: Physical slot number of the line card.
  - *module*: Module number. A physical layer interface module (PLIM) is always 0.
  - *port*: Physical port number of the interface.
- If specifying a virtual interface, the number range varies, depending on interface type.

Both IPv4 and IPv6 BFD sessions can run simultaneously on the same line card.

## Examples

The following example shows how to clear the BFD IPv6 packet counters on a POS interface:

```
RP/0/RSP0/CPU0:router# clear bfd counters packet ipv6 interface POS 0/1/0/0 location 0/1/cpu0
```

The following example shows how to clear the BFD IPv4 timing counters:

```
RP/0/RSP0/CPU0:router# clear bfd counters ipv4 timing location 0/5/cpu0
```

## Related Commands

| Command | Description |
|---|---|
| bfd fast-detect, on page 28 | Enables BFD to detect failures in the path between adjacent forwarding engines. |
| bfd minimum-interval, on page 31 | Specifies the minimum control packet interval for BFD sessions for the corresponding BFD configuration scope. |
| bfd multiplier, on page 38 | Sets the BFD multiplier. |
| show bfd, on page 63 | Displays BFD information for a specific location. |

# clear bfd dampening

To reset BFD dampening counters, use the **clear bfd dampening** command in EXEC mode.

**clear bfd dampening** {[**interface** *type interface-path-id*] | **location** *node-id all* | **type** [**bundle-logical** | **bundle-per-member**]}

## Syntax Description

| | |
|---|---|
| **interface** | Specifies the interface from which the BFD dampening sessions are cleared. |
| *type* | Specifies the interface type. For more information, use the question mark ( **?** ) online help function. |
| *interface-path-id* | Physical interface or virtual interface.<br>**Note** Use the **show interfaces** command to see a list of all interfaces currently configured on the router.<br>For more information about the syntax for the router, use the question mark ( **?** ) online help function. |
| **location** *node-id* | Clears BFD dampening sessions from the specified location. The *node-id* argument is entered in the *rack/slot/module* notation. |
| *all* | (Optional) Clears BFD dampening session on all locations. |
| **type** | Specifies the BFD session type. For more information, use the question mark ( **?** ) online help function. |
| **bundle-per-member** | Clears BFD dampening over the member links of BFD over bundle sessions. |
| **bundle-logical** | Clears BFD dampening of the BFD over logical bundle session. |

## Command Modes

EXEC

## Command History

| Release | Modification |
|---|---|
| Release 4.3.2 | This command was introduced. |
| Release 5.3.0 | Added **type** and **interface** keywords. |

## Usage Guidelines

For the *interface-path-id* argument, use the following guidelines:

- If specifying a physical interface, the naming notation is *rack*/*slot*/*module*/*port*. The slash between values is required as part of the notation. An explanation of each component of the naming notation is as follows:

- *rack*: Chassis number of the rack.
- *slot*: Physical slot number of the line card.
- *module*: Module number. A physical layer interface module (PLIM) is always 0.
- *port*: Physical port number of the interface.

- If specifying a virtual interface, the number range varies, depending on interface type.

## Examples

The following example shows how to clear BFD dampening:

- To clear BFD dampening on all BFD sessions:

```
RP/0/RSP0/CPU0:router# clear bfd dampening location all
```

- To clear BFD dampening on BFD sessions over bundle interfaces:

```
RP/0/RSP0/CPU0:router# clear bfd dampening type bundle-per-member
```

- To clear bfd dampening on BFD sessions over bundle logical interfaces:

```
RP/0/RSP0/CPU0:router# clear bfd dampening type bundle-logical
```

- To clear bfd dampening on BFD sessions over specific interface:

```
RP/0/RSP0/CPU0:router# clear bfd dampening interface gigabitEthernet 0/3/0/0
```

### clear bfd dampening log sample

The following is a sample syslog output of the **clear bfd dampening** command:

```
LC/0/3/CPU0:Oct  6 16:52:40.632 : bfd_agent[127]: %L2-BFD-6-SESSION_DAMPENING_CLR : Dampening
 for BFD session to neighbor 10.1.1.2
on interface GigabitEthernet0/3/0/0 has been cleared
```

# echo disable

To disable echo mode on a router or on an individual interface or bundle, use the **echo disable** command in Bidirectional Forwarding Detection (BFD) configuration mode. To return the router to the default configuration where echo mode is enabled, use the **no** form of this command.

**echo disable**
**no echo disable**

## Syntax Description

This command has no keywords or arguments.

## Command Default

No default behavior or values

## Command Modes

BFD configuration

BFD interface configuration

## Command History

| Release | Modification |
|---|---|
| Release 3.7.2 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

If you are using BFD with Unicast Reverse Path Forwarding (uRPF), you need to use the **echo disable** command to disable echo mode; otherwise, echo packets are rejected.



**Note** To enable or disable IPv4 uRPF checking on an IPv4 interface, use the **[no] ipv4 verify unicast source reachable-via** command in interface configuration mode. To enable or disable loose IPv6 uRPF checking on an IPv6 interface, use the **[no] ipv6 verify unicast source reachable-via any** command in interface configuration mode.

## Task ID

| Task ID | Operations |
|---|---|
| bgp | read, write |
| ospf | read, write |
| isis | read, write |
| mpls-te | read, write |

## Examples

The following example shows how to disable echo mode on a router:

```
RP/0/RSP0/CPU0:router# configure
RP/0/RSP0/CPU0:router(config)# bfd
RP/0/RSP0/CPU0:router(config-bfd)# echo disable
```

The following example shows how to disable echo mode on an individual interface:

```
RP/0/RSP0/CPU0:router# configure
RP/0/RSP0/CPU0:router(config)# bfd
RP/0/RSP0/CPU0:router(config-bfd)# interface gigabitethernet 0/1/0/0
RP/0/RSP0/CPU0:router(config-bfd-if)# echo disable
```

## Related Commands

| Command | Description |
|---|---|
| bfd, on page 5 | Enters BFD configuration mode. |
| interface (BFD), on page 56 | Enters BFD interface configuration mode. |
| **ipv4 verify unicast source reachable-via** | Enables and disables IPv4 uRPF checking on an IPv4 interface. |
| **ipv6 verify unicast source reachable-via any** | Enables and disables loose IPv6 uRPF checking on an IPv6 interface. |
| show bfd, on page 63 | Displays BFD information. |

# echo ipv4 source

To specify the IP address that you want to use as the source address for BFD echo packets, use the **echo ipv4 source** command in BFD or BFD interface configuration mode. To return to the default, use the **no** form of this command.

**echo ipv4 source** *ip-address*
**no echo ipv4 source** *ip-address*

## Syntax Description

| | |
|---|---|
| *ip-address* | 32-bit IPv4 address in dotted-decimal format (A.B.C.D). |

## Command Default

The IP address of the output interface, or the IP address in the **router-id** command (if configured), is the default address used for an echo packet when the **echo ipv4 source** command is not configured.

## Command Modes

BFD configuration

BFD interface configuration

## Command History

| Release | Modification |
|---|---|
| Release 3.9.0 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

If you do not configure the IPv4 source address for echo packets, then BFD uses the IP address of the output interface or the address in the **router-id** command if specified.

You can override the default address for BFD echo packets by specifying an IPv4 source address for echo packets globally for all BFD sessions on the router and at an individual interface. Specifying the IP address at an individual interface will override any value specified globally for BFD on the router.

## Task ID

| Task ID | Operations |
|---|---|
| bgp | read, write |
| ospf | read, write |
| isis | read, write |
| mpls-te | read, write |

## Examples

The following example shows how to specify the IP address 10.10.10.1 as the source address for BFD echo packets for all BFD sessions on the router:

```
RP/0/RSP0/CPU0:router# configure
RP/0/RSP0/CPU0:router(config)# bfd
RP/0/RSP0/CPU0:router(config-bfd)# echo ipv4 source 10.10.10.1
```

The following example shows how to specify the IP address 10.10.10.1 as the source address for BFD echo packets on an individual Gigabit Ethernet interface:

```
RP/0/RSP0/CPU0:router# configure
RP/0/RSP0/CPU0:router(config)# bfd
RP/0/RSP0/CPU0:router(config-bfd)# interface gigabitethernet 0/1/0/0
RP/0/RSP0/CPU0:router(config-bfd-if)# echo ipv4 source 10.10.10.1
```

The following example shows how to specify the IP address 10.10.10.1 as the source address for BFD echo packets on an individual Packet-over-SONET (POS) interface:

```
RP/0/RSP0/CPU0:router# configure
RP/0/RSP0/CPU0:router(config)# bfd
RP/0/RSP0/CPU0:router(config-bfd)# interface pos 0/1/0/0
RP/0/RSP0/CPU0:router(config-bfd-if)# echo ipv4 source 10.10.10.1
```

## Related Commands

| Command | Description |
|---|---|
| bfd, on page 5 | Enters BFD configuration mode. |
| echo disable, on page 46 | Disables echo mode on a router or on an individual interface or bundle. |

# echo latency detect

To enable latency detection for BFD echo packets, use the **echo latency detect** command in BFD configuration mode. To return to the default, use the **no** form of this command.

**echo latency detect** [**percentage** *percent-value* [**count** *packet-count*]]
**no echo latency detect** [**percentage** *percent-value* [**count** *packet-count*]]

## Syntax Description

| | |
|---|---|
| **percentage** *percent-value* | (Optional) Percentage of the echo failure detection time to be detected as bad latency. The range is 100 to 250. The default is 100. |
| **count** *packet-count* | (Optional) Number of consecutive packets received with the detected bad latency that will take down a BFD session. The range is 1 to 10. The default is 1. |

## Command Default

Echo latency detection is disabled.

## Command Modes

BFD configuration

## Command History

| Release | Modification |
|---|---|
| Release 4.0.0 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

**Note** Latency detection is only valid where echo mode is supported for BFD. However, it is not supported on bundle interfaces.

Without latency detection, standard BFD echo failure detection tracks only the absence of receipt of echo packets within a period of time based on a counter. However, this standard echo failure detection does not address latency between transmission and receipt of any specific echo packet, which can build beyond desired tolerances over the course of the BFD session.

When latency detection is enabled, a percentage is multiplied to the echo failure detection value (I x M x %), and the roundtrip delay is computed for the echo packet. If this delay is greater than (I x M x %), then the BFD session is taken down.

If you have specified a packet count, then the system tracks the number of packets received back-to-back with bad latency before taking down the session.

## Task ID

| Task ID | Operations |
|---|---|
| bgp | read, write |

| Task ID | Operations |
|---|---|
| ospf | read, write |
| isis | read, write |
| mpls-te | read, write |

## Examples

In the following examples, consider that the BFD minimum interval is 50 ms, and the multiplier is 3 for the BFD session.

The following example shows how to enable echo latency detection using the default values of 100% of the echo failure period (I x M) for a packet count of 1. In this example, when one echo packet is detected with a roundtrip delay greater than 150 ms, the session is taken down:

```
RP/0/RSP0/CPU0:router# configure
RP/0/RSP0/CPU0:router(config)# bfd
RP/0/RSP0/CPU0:router(config-bfd)# echo latency detect
```

The following example shows how to enable echo latency detection based on 200% (two times) of the echo failure period for a packet count of 1. In this example, when one packet is detected with a roundtrip delay greater than 300 ms, the session is taken down:

```
RP/0/RSP0/CPU0:router# configure
RP/0/RSP0/CPU0:router(config)# bfd
RP/0/RSP0/CPU0:router(config-bfd)# echo latency detect percentage 200
```

The following example shows how to enable echo latency detection based on 100% of the echo failure period for a packet count of 3. In this example, when three consecutive echo packets are detected with a roundtrip delay greater than 150 ms, the session is taken down:

```
RP/0/RSP0/CPU0:router# configure
RP/0/RSP0/CPU0:router(config)# bfd
RP/0/RSP0/CPU0:router(config-bfd)# echo latency detect percentage 100 count 3
```

## Related Commands

| Command | Description |
|---|---|
| bfd, on page 5 | Enters BFD configuration mode. |
| bfd minimum-interval, on page 31 | Specifies the minimum control packet interval for BFD sessions for the corresponding BFD configuration scope. |
| bfd multiplier, on page 38 | Sets the BFD multiplier. |
| echo startup validate, on page 52 | Enables verification of the echo packet path before starting a BFD session. |

# echo startup validate

To enable verification of the echo packet path before starting a BFD session, use the **echo startup validate** command in BFD configuration mode. To return to the default, use the **no** form of this command.

**echo startup** [**force**]
**no echo startup** [**force**]

**Syntax Description**

| | |
|---|---|
| **force** | (Optional) Ignores the remote 'Required Min Echo RX Interval' setting. |

**Command Default**

Echo startup validation is disabled.

**Command Modes**

BFD configuration

**Command History**

| Release | Modification |
|---|---|
| Release 4.0.0 | This command was introduced. |

**Usage Guidelines**

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

**Note** Echo validation is only valid where echo mode is supported for BFD. However, it is not supported on bundle interfaces.

When a BFD session is down and the **echo startup validate** command is configured, an echo packet is periodically transmitted on the link while it is down to verify successful transmission within the configured latency before allowing the BFD session to change state.

Without the **force** option, the echo validation test only runs if the last received control packet contains a non-zero “Required Min Echo RX Interval” value. When the **force** keyword is configured, the echo validation test runs regardless of this value.

**Task ID**

| Task ID | Operations |
|---|---|
| bgp | read, write |
| ospf | read, write |
| isis | read, write |
| mpls-te | read, write |

## Examples

The following example shows how to enable echo startup validation for BFD sessions on non-bundle interfaces if the last received control packet contains a non-zero “Required Min Echo RX Interval” value:

```
RP/0/RSP0/CPU0:router# configure
RP/0/RSP0/CPU0:router(config)# bfd
RP/0/RSP0/CPU0:router(config-bfd)# echo startup validate
```

The following example shows how to enable echo startup validation for BFD sessions on non-bundle interfaces regardless of the “Required Min Echo RX Interval” value in the last control packet:

```
RP/0/RSP0/CPU0:router# configure
RP/0/RSP0/CPU0:router(config)# bfd
RP/0/RSP0/CPU0:router(config-bfd)# echo startup validate force
```

## Related Commands

| Command | Description |
|---|---|
| bfd, on page 5 | Enters BFD configuration mode. |
| echo latency detect, on page 50 | Enables latency detection for BFD echo packets. |

# hw-module bfd-hw-offload

To enable BFD hardware offload mode, use the **hw-module bfd-hw-offload** command in admin mode. To disable BFD hardware offload mode, use the **no** form of this command.

**Note**
- The BFD hardware offload mode is supported on Cisco ASR 9000 Enhanced Ethernet Line Card and Cisco ASR 9000 High Density 100GE Ethernet Line Card.

**hw-module bfd-hw-offload enable location** *line card location*
**no hw-module bfd-hw-offload enable location** *line card location*

## Syntax Description

| | |
|---|---|
| **enable** | Enables BFD hardware offload mode.<br>Only BFD IPv4 and IPv6 sessions over physical and VLAN interfaces (in asynchronous mode) and BFD over MPLS-TP LSP single path sessions are supported. |
| *line card location* | Specify the line card location.<br>Only the ASR 9000 Enhanced Ethernet Line Card supports BFD hardware offload mode. |

## Command Default

BFD hardware offload mode is disabled.

## Command Modes

Global configuration.

## Command History

| Release | Modification |
|---|---|
| Release 5.1.2 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

- BFD hardware offload mode is disabled by default. You can enable it in admin mode.
- You must reload the line cards after enabling or disabling BFD hardware offload mode for the configuration to take effect.
- BFD hardware offload is not supported on virtual interfaces.

## Task ID

| Task ID | Operations |
|---|---|
| root | read, write |

## Examples

The below example shows how to enable BFD hardware offload mode on the ASR 9000 Enhanced Ethernet Line Card in the location 0/0/CPU0:

```
RP/0/RSP0/CPU0:router# admin
RP/0/RSP0/CPU0:router(admin)# hw-module bfd-hw-offload enable location 0/0/CPU0
```

# interface (BFD)

To enter Bidirectional Forwarding Detection (BFD) interface configuration mode, where you can disable echo mode on an interface, use the **interface** command in BFD configuration mode. To return to BFD configuration mode, use the **no** form of this command.

**interface** *type interface-path-id*
**no interface** *type interface-path-id*

## Syntax Description

| | |
|---|---|
| *type* | Interface type. For more information, use the question mark (**?**) online help function. |
| *interface-path-id* | Physical interface or virtual interface.<br>**Note** Use the **show interfaces** command to see a list of all interfaces currently configured on the router.<br>For more information about the syntax for the router, use the question mark (**?**) online help function. |

## Command Default

No default behavior or values

## Command Modes

BFD configuration

## Command History

| Release | Modification |
|---|---|
| Release 3.7.2 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

For the *interface-path-id* argument, use the following guidelines:

- If specifying a physical interface, the naming notation is *rack*/*slot*/*module*/*port*. The slash between values is required as part of the notation. An explanation of each component of the naming notation is as follows:
  - *rack*: Chassis number of the rack.
  - *slot*: Physical slot number of the line card.
  - *module*: Module number. A physical layer interface module (PLIM) is always 0.
  - *port*: Physical port number of the interface.
- If specifying a virtual interface, the number range varies, depending on interface type.

If you are using BFD with Unicast Reverse Path Forwarding (uRPF) on a particular interface, then you need to use the **echo disable** command in BFD interface configuration mode to disable echo mode on that interface; otherwise, echo packets are rejected by the interface.

**Note** To enable or disable IPv4 uRPF checking on an IPv4 interface, use the **[no] ipv4 verify unicast source reachable-via** command in interface configuration mode. To enable or disable loose IPv6 uRPF checking on an IPv6 interface, use the **[no] ipv6 verify unicast source reachable-via any** command in interface configuration mode.

## Task ID

| Task ID | Operations |
|---|---|
| bgp | read, write |
| ospf | read, write |
| isis | read, write |
| mpls-te | read, write |

## Examples

The following example shows how to enter BFD interface configuration mode for a Gigabit Ethernet interface:

```
RP/0/RSP0/CPU0:router# configure
RP/0/RSP0/CPU0:router(config)# bfd
RP/0/RSP0/CPU0:router(config-bfd)# interface gigabitethernet 0/1/0/0
RP/0/RSP0/CPU0:router(config-bfd-if)#
```

The following example shows how to enter BFD interface configuration mode for a Packet-over-SONET/SDH (POS) interface:

```
RP/0/RSP0/CPU0:router# configure
RP/0/RSP0/CPU0:router(config)# bfd
RP/0/RSP0/CPU0:router(config-bfd)# interface pos 0/1/0/0
RP/0/RSP0/CPU0:router(config-bfd-if)#
```

## Related Commands

| Command | Description |
|---|---|
| bfd, on page 5 | Enters BFD configuration mode. |
| echo disable, on page 46 | Disables echo mode on an individual interface or on the entire router. |
| **ipv4 verify unicast source reachable-via** | Enables and disables IPv4 uRPF checking on an IPv4 interface. |

| Command | Description |
| --- | --- |
| **ipv6 verify unicast source reachable-via any** | Enables and disables loose IPv6 uRPF checking on an IPv6 interface. |
| show bfd, on page 63 | Displays BFD information. |

# ipv6 checksum

To enable and disable IPv6 checksum calculations on BFD UDP packets globally or on a BFD interface, use the **ipv6 checksum** command in Bidirectional Forwarding Detection (BFD) or BFD interface configuration mode. To return to the default, use the **no** form of this command.

**BFD Configuration**
**ipv6 checksum disable**
**no ipv6 checksum disable**

**BFD Interface Configuration**
**ipv6 checksum** [**disable**]
**no ipv6 checksum** [**disable**]

## Syntax Description

| | |
|---|---|
| **disable** | (Optional for BFD interface configuration only) Disables IPv6 checksum calculations. |

## Command Default

IPv6 checksum calculations on BFD UDP packets is disabled.

## Command Modes

BFD configuration

BFD interface configuration

## Command History

| Release | Modification |
|---|---|
| Release 4.0.0 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

IPv6 checksum calculations for UDP packets are disable by default for BFD sessions. You can enable IPv6 checksum support either globally for all BFD sessions, or on an individual interface.

## Task ID

| Task ID | Operations |
|---|---|
| bgp | read, write |
| ospf | read, write |
| isis | read, write |
| mpls-te | read, write |

## Examples

The following example shows how to enable IPv6 checksum calculations for UDP packets for all BFD sessions on the router:

```
RP/0/RSP0/CPU0:router# configure
RP/0/RSP0/CPU0:router(config)# bfd
RP/0/RSP0/CPU0:router(config-bfd)# no ipv6 checksum disable
```

The following example shows how to disable IPv6 checksum calculations for UDP packets for all BFD sessions on the router:

```
RP/0/RSP0/CPU0:router# configure
RP/0/RSP0/CPU0:router(config)# bfd
RP/0/RSP0/CPU0:router(config-bfd)# ipv6 checksum disable
```

The following example shows how to enable echo mode for BFD sessions on an individual interface:

```
RP/0/RSP0/CPU0:router# configure
RP/0/RSP0/CPU0:router(config)# bfd
RP/0/RSP0/CPU0:router(config-bfd)# interface gigabitethernet 0/1/0/0
RP/0/RSP0/CPU0:router(config-bfd-if)# ipv6 checksum
```

The following example shows how to disable echo mode for BFD sessions on an individual interface:

```
RP/0/RSP0/CPU0:router# configure
RP/0/RSP0/CPU0:router(config)# bfd
RP/0/RSP0/CPU0:router(config-bfd)# interface gigabitethernet 0/1/0/0
RP/0/RSP0/CPU0:router(config-bfd-if)# ipv6 checksum disable
```

## Related Commands

| Command | Description |
|---|---|
| bfd, on page 5 | Enters BFD configuration mode. |
| interface (BFD), on page 56 | Enters BFD interface configuration mode, where you can disable echo mode on an interface. |
| show bfd, on page 63 | Displays BFD information for a specific location. |

# multihop ttl-drop-threshold

To specify the maximum time to live (TTL) value for multihop sessions per system, use the **multihop ttl-drop-threshold** command in the BFD configuration mode. To return to the default, use the **no** form of this command.

**multihop ttl-drop-threshold** *value*
**no multihop ttl-drop-threshold** *value*

**Syntax Description**

| | |
|---|---|
| *value* | Specifies the configurable range of values for TTL. It ranges from 0 to 254. |

**Command Default**

No default behavior or values

**Command Modes**

BFD configuration

**Command History**

| Release | Modification |
|---|---|
| Release 4.2.0 | This command was introduced. |

**Usage Guidelines**

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

When the TTL of a BFD packet is received on the router, the value is decremented by one and then compared with the configured ttl-drop-threshold.

- If the TTL of a BFD packet after decrementing is less than the configured ttl-drop-threshold, the packet will be dropped.
- If the TTL of a BFD packet received on the router after decrementing is greater than or equal to the configured ttl-drop-threshold, the packet will be processed.



**Note** This configuration command is only applicable for BFD multihop sessions.

**Task ID**

| Task ID | Operation |
|---|---|
| bgp | read, write |
| ospf | read, write |
| isis | read, write |

| Task ID | Operation |
|---|---|
| mpls-te | read, write |

### Example

This example shows how to set the maximum TTL value as 2 using the **multihop ttl-drop-threshold** command:

```
RP/0/RSP0/CPU0:router# configure
RP/0/RSP0/CPU0:router(config)# bfd multihop ttl-drop-threshold 2
```

## Related Commands

| Command | Description |
|---|---|
| show bfd counters, on page 68 | Displays BFD counter information. |
| show bfd multipath, on page 76 | Displays information regarding BFD multipath sessions. |

# show bfd

To display Bidirectional Forwarding Detection (BFD) information for a specific location, use the **show bfd** command in EXEC mode.

**show bfd** [**ipv4** | [**singlehop** | **multihop** ] | **ipv6** [**singlehop** | **multihop** ]| **all**|**label**]**interface**[**destination** | **source** ] [**location** *node-id*]

## Syntax Description

| | |
|---|---|
| **ipv4** | (Optional) Displays BFD over IPv4 information only. |
| **multihop** | (Optional) Displays BFD multihop information only. |
| **singlehop** | (Optional) Displays BFD singlehop information only. |
| **ipv6** | (Optional) Displays BFD over IPv6 information only. |
| **all** | (Optional) Displays both BFD over IPv4 and BFD over IPv6 information. |
| **label** | (Optional) Displays the BFD label information. |
| **interface** | Specifies the BFD interface. |
| **destination** | (Optional) Specifies the destination IPv4 unicast address. |
| **source** | (Optional) Specifies the source IPv4 unicast address. |
| **location** *node-id* | Displays BFD information for the specified location. The *node-id* argument is entered in the *rack/slot/module* notation. |

## Command Default

The default is the default address family identifier (AFI) that is set by the **set default-afi** command, IPv4 or IPv6.

## Command Modes

EXEC

## Command History

| Release | Modification |
|---|---|
| Release 3.7.2 | This command was introduced. |
| Release 4.0.0 | Support for the **ipv6** keyword was added. |
| Release 4.2.0 | Support for **multihop** keyword was added. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

## Task ID

| Task ID | Operations |
|---|---|
| bgp | read |

| Task ID | Operations |
|---|---|
| ospf | read |
| isis | read |
| mpls-te | read |

## Examples

The following example shows the output from the **show bfd** command:

```
RP/0/RSP0/CPU0:router# show bfd

IPV4 Sessions Up: 0, Down: 0, Total: 0
```

The following example shows the output from the **show bfd all** command:

```
RP/0/RSP0/CPU0:router# show bfd all

IPv4:
-----
IPV4 Sessions Up: 20, Down: 0, Unknown/Retry: 2, Total: 22
IPv6:
-----
IPV6 Sessions Up: 128, Down: 2, Unknown/Retry: 1, Total: 131
Label:
-----
Label Sessions Up: 10, Down: 0, Unknown/Retry: 1, Total: 11
```

The following example shows the output from the **show bfd ipv4** command:

```
RP/0/RSP0/CPU0:router# show bfd ipv4

IPV4 Sessions Up: 0, Down: 0, Total: 0
```

The following example shows the output from the **show bfd ipv6** command:

```
RP/0/RSP0/CPU0:router# show bfd ipv6

IPV6 Sessions Up: 0, Down: 0, Total: 0
```

The following example shows the output from the **show bfd ipv4 location** command:

```
RP/0/RSP0/CPU0:router# show bfd ipv6 session detail interface tenGigE 0/0/0/0.100

I/f: TenGigE0/0/0/0.100, Location: 0/0/CPU0
Dest: 1001:1:1:1:1:1:1:2
Src: 1001:1:1:1:1:1:1:1
 State: UP for 0d:1h:37m:3s, number of times UP: 1
 Session type: PR/V6/SH
Received parameters:
 Version: 1, desired tx interval: 300 ms, required rx interval: 300 ms
 Required echo rx interval: 0 us, multiplier: 3, diag: None
```

```
 My discr: 2148076695, your discr: 2148075550, state UP, D/F/P/C/A: 0/0/0/1/0
Transmitted parameters:
 Version: 1, desired tx interval: 300 ms, required rx interval: 300 ms
 Required echo rx interval: 0 us, multiplier: 3, diag: None
 My discr: 2148075550, your discr: 2148076695, state UP, D/F/P/C/A: 0/1/0/1/0
Timer Values:
 Local negotiated async tx interval: 300 ms
 Remote negotiated async tx interval: 300 ms
 Desired echo tx interval: 0 s, local negotiated echo tx interval: 0 us
 Echo detection time: 0 us(0 us*3), async detection time: 900 ms(300 ms*3)
Local Stats:
 Intervals between async packets:
   Tx: Number of intervals=3, min=10 ms, max=2290 ms, avg=824 ms
       Last packet transmitted 5823 s ago
   Rx: Number of intervals=6, min=3 ms, max=2 s, avg=461 ms
       Last packet received 5823 s ago
Intervals between echo packets:
   Tx: Number of intervals=0, min=0 s, max=0 s, avg=0 s
       Last packet transmitted 0 s ago
   Rx: Number of intervals=0, min=0 s, max=0 s, avg=0 s
       Last packet received 0 s ago
 Latency of echo packets (time between tx and rx):
   Number of packets: 0, min=0 us, max=0 us, avg=0 us
Session owner information:
                          Desired               Adjusted
  Client                Interval   Multiplier Interval   Multiplier
  --------------------- ---------- ---------- ---------- ----------
  ipv6_static           300 ms     3          300 ms     3
  ipv6_static           300 ms     3          300 ms     3

H/W Offload Info:
 H/W Offload capability : Y, Hosted NPU     : 0/0/CPU0/NPU0
 Async Offloaded        : Y, Echo Offloaded : N
 Async rx/tx            : 7/4

Platform Info:
NPU ID: 0
Async RTC ID        : 1          Echo RTC ID        : 0
Async Feature Mask  : 0x8        Echo Feature Mask  : 0x0
Async Session ID    : 0x3c07     Echo Session ID    : 0x0
Async Tx Key        : 0x3c070801  Echo Tx Key        : 0x0
Async Tx Stats addr : 0x3f69e800   Echo Tx Stats addr : 0x0
Async Rx Stats addr : 0x4069e800   Echo Rx Stats addr : 0x0
```

## Related Commands

| Command | Description |
|---|---|
| bfd fast-detect, on page 28 | Enables BFD to detect failures in the path between adjacent forwarding engines. |
| bfd minimum-interval, on page 31 | Specifies the minimum control packet interval for BFD sessions for the corresponding BFD configuration scope. |
| bfd multiplier, on page 38 | Sets the BFD multiplier. |

# show bfd client

To display Bidirectional Forwarding Detection (BFD) client information, use the **show bfd client** command in EXEC mode.

**show bfd client** [**detail**]

## Syntax Description

| | |
|---|---|
| **detail** | (Optional) Specifies detailed client information including number of sessions and client reconnects. |

## Command Default

Enter the **show bfd client** command without specifying the **detail** keyword to display summarized BFD client information.

## Command Modes

EXEC

## Command History

| Release | Modification |
|---|---|
| Release 3.7.2 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

## Task ID

| Task ID | Operations |
|---|---|
| bgp | read |
| ospf | read |
| isis | read |
| mpls-te | read |

## Examples

The following example shows the output from the **show bfd client** command:

```
RP/0/RSP0/CPU0:router# show bfd client

Name            Node       Num sessions
--------------- ---------- --------------
bgp             0/RSP0/CPU0 0
isis            0/RSP0/CPU0 0
isis            0/RSP0/CPU0 0
```

***Table 1: show bfd client Field Descriptions***

| Field | Description |
|---|---|
| Name | Name of the BFD client. |

| Field | Description |
|---|---|
| Node | Location of the BFD client. |
| Num sessions | Number of active sessions for the BFD client. |

## Related Commands

| Command | Description |
|---|---|
| bfd fast-detect, on page 28 | Enables BFD to detect failures in the path between adjacent forwarding engines. |
| bfd minimum-interval, on page 31 | Specifies the minimum control packet interval for BFD sessions for the corresponding BFD configuration scope. |
| bfd multiplier, on page 38 | Sets the BFD multiplier. |
| show bfd, on page 63 | Displays BFD information for a specific location. |

# show bfd counters

To display Bidirectional Forwarding Detection (BFD) counter information, use the **show bfd counters** command in EXEC mode.

**show bfd counters** [**ipv4** | [**singlehop** | **multihop**] | **ipv6** [**singlehop** | **multihop**]| **all**| **label**] **packet** [**interface** *type interface-path-id*] **location** *node-id*

## Syntax Description

| | |
|---|---|
| **ipv4** | (Optional) Displays BFD over IPv4 information only. |
| **ipv6** | (Optional) Displays BFD over IPv6 information only. |
| **singlehop** | (Optional) Displays BFD singlehop information only. |
| **multihop** | (Optional) Displays BFD multihop information only. |
| **all** | (Optional) Displays both BFD over IPv4 and BFD over IPv6 information. |
| **packet** | Specifies that packet counters are displayed. |
| **interface** | (Optional) Specifies the interface for which to show counters. |
| *type* | Interface type. For more information, use the question mark (**?**) online help function. |
| *interface-path-id* | Physical interface or virtual interface.<br>**Note** Use the **show interfaces** command to see a list of all interfaces currently configured on the router.<br>For more information about the syntax for the router, use the question mark (**?**) online help function. |
| **location** *node-id* | Displays BFD counters from the specified location. The *node-id* argument is entered in the *rack/slot/module* notation. |

## Command Default

The default is the default address family identifier (AFI) that is set by the **set default-afi** command, IPv4 or IPv6.

## Command Modes

EXEC

## Command History

| Release | Modification |
|---|---|
| Release 3.7.2 | This command was introduced. |
| Release 4.0.0 | Support for the **ipv6** keyword was added. |
| Release 4.2.0 | Support for the **singlehop** and **multihop** keywords were added. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

For the *interface-path-id* argument, use the following guidelines:

- If specifying a physical interface, the naming notation is *rack*/*slot*/*module*/*port*. The slash between values is required as part of the notation. An explanation of each component of the naming notation is as follows:
  - *rack*: Chassis number of the rack.
  - *slot*: Physical slot number of the line card.
  - *module*: Module number. A physical layer interface module (PLIM) is always 0.
  - *port*: Physical port number of the interface.
- If specifying a virtual interface, the number range varies, depending on interface type.

## Task ID

| Task ID | Operations |
|---|---|
| bgp | read |
| ospf | read |
| isis | read |
| mpls-te | read |

## Examples

The following example shows the output from the **show bfd counters packet** command for both IPv4 and IPv6:

```
RP/0/RSP0/CPU0:router# show bfd counters packet all interface POS 0/1/0/0 location
 0/1/cpu0

Mon Nov  5 08:49:51.950 UTC
IPv4:
-----
 POS 0/1/0/0             Recv       Xmit                Recv       Xmit
      Async:             520        515       Echo:     9400       9400

IPv6:
-----
 POS 0/1/0/0             Recv       Xmit                Recv       Xmit
      Async:             237        237       Echo:        0          0
```

The following example shows the output from the **show bfd counters packet** command for IPv4:

```
RP/0/RSP0/CPU0:router# show bfd counters ipv4 packet

IPv4 Singlehop:
 GigabitEthernet0/0/1/2                  Recv       Xmit                 Recv       Xmit
      Async:                             4148       4137       Echo: (   47136)     80192
 GigabitEthernet0/1/1/2                  Recv       Xmit                 Recv       Xmit
      Async:                             116876     125756       Echo: ( 2268192)   2301312
```

```
 Bundle-Ether10                          Recv       Xmit                 Recv       Xmit
      Async:                             2          0       Echo:        0          0
 Bundle-Ether20                          Recv       Xmit                 Recv       Xmit
      Async:                             91         0       Echo:        0          0

IPv4 Multihop: (Src IP/Dst IP/Vrf Id)
 33.15.151.4/33.16.151.4/0x12345678      Recv       Xmit
      Async:                             0       570337
```

***Table 2: show bfd counters packet Field Descriptions***

| Field | Description |
|---|---|
| Async | Number of asynchronous mode (control) packets that were received or transmitted on the specified interface. |
| Echo | Number of echo packets that were received or transmitted on the specified interface. |

## Related Commands

| Command | Description |
|---|---|
| bfd fast-detect, on page 28 | Enables BFD to detect failures in the path between adjacent forwarding engines. |
| bfd minimum-interval, on page 31 | Specifies the minimum control packet interval for BFD sessions for the corresponding BFD configuration scope. |
| bfd multiplier, on page 38 | Sets the BFD multiplier. |

# show bfd hw-offload

To display BFD hardware offload information, use the **show bfd hw-offload** command in EXEC mode.

**show bfd hw-offload** {**state location** *location-id* | **summary location** *location-id*}

## Syntax Description

| | |
|---|---|
| **state** | Displays if BFD hardware offload is enabled or disabled on the line card. |
| **summary** | Displays total number of sessions configured for each timer interval on the line card and network processor unit. |
| *location-id* | Specifies location-ID number of the line card. |

## Command Default

None.

## Command Modes

EXEC

## Command History

| Release | Modification |
|---|---|
| Release 5.1.2 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

## Task ID

| Task ID | Operation |
|---|---|
| root | read |

This is the sample output from the **show bfd hw-offload** command when **state** is used:

```
RP/0/RSP0/CPU0:router# show bfd hw-offload state location 0/0/CPU0

BFD HW OFFLOAD Feature state:

0/0/CPU0
-----------------
Configuration State:   Enabled
Operational   State:   Enabled
```

This is the sample output from the **show bfd hw-offload** command when **summary** is used:

```
RP/0/RSP0/CPU0:router# show bfd hw-offload summary location 0/2/CPU0
BFD HW OFFLOAD Feature Summary:

0/2/CPU0
==========

The below available numbers per timer interval indicates the
```

```
max. sessions that can be configurd at that interval without
configuring any other session at any other interval.

After configuring, execute this CLI to get the remaining
available numbers.

              3.3ms   15ms    50ms    300ms   1s      2s      30s
-------------------------------------------------------------------------
Max LC Supp   600     2000    8000    8000    8000    8000    8000
Max NP Supp   300     1000    3000    3000    3000    3000    3000

-------------------------------------------------------------------------
LC:
----
Tx Used       0       0       8000    0       0       0       0
Rx Used       0       0       8000    0       0       0       0
Tx Avail      0       0       0       0       0       0       0
Rx Avail      0       0       0       0       0       0       0

NP0:
-----
Tx Used       0       0       3000    0       0       0       0
Rx Used       0       0       3000    0       0       0       0
Tx Avail      0       0       0       0       0       0       0
Rx Avail      0       0       0       0       0       0       0

NP1:
-----
Tx Used       0       0       3000    0       0       0       0
Rx Used       0       0       3000    0       0       0       0
Tx Avail      0       0       0       0       0       0       0
Rx Avail      0       0       0       0       0       0       0

NP2:
-----
Tx Used       0       0       0       0       0       0       0
Rx Used       0       0       0       0       0       0       0
Tx Avail      0       0       0       0       0       0       0
Rx Avail      0       0       0       0       0       0       0

NP3:
-----
Tx Used       0       0       2000    0       0       0       0
Rx Used       0       0       2000    0       0       0       0
Tx Avail      0       0       0       0       0       0       0
Rx Avail      0       0       0       0       0       0       0
```

## Related Commands

| Command | Description |
|---|---|
| show bfd counters, on page 68 | Displays BFD counter information. |

# show bfd mib session

To display IPv4 and IPv6 Bidirectional Forwarding Detection (BFD) MIB session information, use the **show bfd mib session** command in EXEC mode.

**show bfd mib session** [**location** *node-id*]

## Syntax Description

| | |
|---|---|
| **location** *node-id* | (Optional) Displays all IPv4 and IPv6 BFD MIB session information stored on the specified node. The *node-id* argument is entered in the *rack/slot/module* notation. |

## Command Default

When *node-id* is not specified, information for all IPv4 and IPv6 BFD MIB sessions, stored on the route processor node, is displayed.

## Command Modes

EXEC

## Command History

| Release | Modification |
|---|---|
| Release 3.9.0 | This command was introduced. |
| Release 4.0.0 | Support for the display of IPv6 BFD MIB session information was added. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

When *node-id* is not specified, information for all IPv4 and IPv6 BFD MIB sessions, stored on the route processor node, is displayed, and this information is populated and updated only after SNMP operations for those BFD MIB sessions are performed.

When *node-id* is specified, information for all IPv4 and IPv6 BFD MIB sessions, stored on the specified node (linecard), is displayed, and this information is updated automatically without SNMP operations being performed.

## Task ID

| Task ID | Operations |
|---|---|
| bgp | read |
| ospf | read |
| isis | read |
| mpls-te | read |

## Examples

The following example displays all IPv4 and IPv6 BFD MIB session information stored on the RP node:

```
RP/0/RSP0/CPU0:router# show bfd mib session
```

```
Tue Sep  9 07:49:30.828 PST DST
Local Discr: 327681(0x50001), Remote Discr: 0(0x0)
BFD session: GigabitEthernet0_1_5_2(0x11800c0), 10.27.4.7
  Current State: ADMIN DOWN, Number of Times UP: 0
  Running Version: 0, Last Down Diag: None
  Last Up Time (s.ns): 0.0
  Last Down Time (s.ns): 0.0
  Detection Multiplier: 0
  Desired Min TX Interval: 0
  Required Min RX Interval: 0
  Required Min RX Echo Interval: 0
  Packets in/out: 0/0
  Current Trap Bitmap: 0x0
  Last Time Cached: Not yet cached
```

The following example displays all IPv4 and IPv6 BFD MIB session information stored on 0/1/CPU0:

```
RP/0/RSP0/CPU0:router# show bfd mib session location 0/1/CPU0

Tue Sep  9 07:44:49.190 PST DST
Local Discr: 327681(0x50001), Remote Discr: 0(0x0)
BFD session: GigabitEthernet0_1_5_2(0x11800c0), 10.27.4.7
  Number of times UP: 0
  Last Down Diag: None
  Last Up Time (s.ns): 0.0
  Last Down Time (s.ns): 0.0
  Packets in/out: 0/1140134
```

***Table 3: show bfd mib Field Descriptions***

| Field | Description |
|---|---|
| date and timestamp | Date and time stamp during which a snapshot of the BFD MIB session information is taken. |
| Local Discr | Local discriminator (in decimal and hexadecimal) that uniquely identifies the BFD MIB session. |
| Remote Discr | Session discriminator (in decimal and hexadecimal) that was chosen by the remote system for the BFD MIB session. |
| BFD session | Index of interface upon which the BFD MIB session is running. Also, neighboring IP address that is monitored with the BFD MIB session. |
| Current State | Current state of the BFD MIB session. |
| Number of Times UP | Number of times the BFD MIB session has gone into the up state since the router was last rebooted. |
| Running Version | BFD protocol version number in which the BFD MIB session is running. |
| Last Down Diag | Diagnostic value associated with the last time the BFD MIB session went down. |
| Last Up Time (s.ns) | Value of sysUpTime, in *seconds.nanoseconds*, during which the BFD MIB session last came up. If such an event does not exist, a zero is displayed. |

| Field | Description |
|---|---|
| Last Down Time (s.ns) | Value of sysUpTime, in *seconds.nanoseconds*, during which communication was last lost with the neighbor. If such an event does not exist, a zero is displayed. |
| Detection Multiplier | Failure detection multiplier. |
| Desired Min TX Interval | Minimum interval, in microseconds, preferred by the local system when transmitting BFD control packets. |
| Required Min RX Interval | Minimum interval, in microseconds, that the local system supports between received BFD control packets. |
| Required Min RX Echo Interval | Minimum interval, in microseconds, that the local system supports between received BFD echo packets. |
| Packets in/out | Total number of BFD messages received and transmitted for the BFD MIB session. |
| Current Trap Bitmap | Bits that control the trap for the BFD MIB session. A nonzero value indicates that the trap is generated when the next trap event is triggered. |
| Last Time Cached | When information for the BFD MIB session was last cached. Typically, the information is cached when SNMP operations for the BFD MIB session are performed. |

## Related Commands

| Command | Description |
|---|---|
| show bfd session, on page 78 | |

# show bfd multipath

To display information concerning only BFD multipath sessions, use the **show bfd multipath** command in the EXEC mode.

**show bfd multipath** {**ipv4** | **ipv6** | **label** | **all**} **location** *node-id*

**Syntax Description**

| | |
|---|---|
| **ipv4** | Displays BFD over IPv4 information only. |
| **ipv6** | Displays BFD over IPv6 information only. |
| **label** | Displays BFD label information. |
| **all** | Displays both BFD over IPv4 and BFD over IPv6 information. |
| **location** *node-id* | Displays BFD counters from the specified location. The *node-id* argument is entered in the *rack/slot/module* notation. |

**Command Default**

No default behavior or values

**Command Modes**

EXEC

**Command History**

| Release | Modification |
|---|---|
| Release 4.2.0 | This command was introduced. |

**Usage Guidelines**

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

**Task ID**

| Task ID | Operation |
|---|---|
| bgp | read |
| ospf | read |
| isis | read |
| mpls-te | read |

### Example

This example shows the sample output for **show bfd multipath** command:

```
RP/0/RSP0/CPU0:router#show bfd multipath location 0/5/cpu0
```

```
Int/Src Addr    Label/Dest Addr VRF ID     Discr      Node      State
--------------- --------------- ---------- ---------- --------- ---------
pw-ether 1      10.10.10.10     0x00000002 0x4        0/5/CPU0  DOWN
tunnel-ip 1     1.1.1.1         0x8        0x5        0/5/CPU0  UP
```

# show bfd session

To display Bidirectional Forwarding Detection (BFD) session information, use the **show bfd session** command in EXEC mode.

**show bfd** [**ipv4** | [**singlehop** | **multihop**] | **ipv6** | [**singlehop** | **multihop**] | **all** | **label**] **session** [**interface** *type interface-path-id* [**destination** *ip-address*] [**detail**][**in-label]**] **location** *node-id*

## Syntax Description

| | |
|---|---|
| **ipv4** | (Optional) Displays BFD over IPv4 information only. |
| **ipv6** | (Optional) Displays BFD over IPv6 information only. |
| **singlehop** | (Optional) Displays BFD singlehop information only. |
| **multihop** | (Optional) Displays BFD multihop information only. |
| **all** | (Optional) Displays both BFD over IPv4 and BFD over IPv6 information. |
| **label** | (Optional) Displays the MPLS Transport Profile (MPLS-TP) label BFD information only. |
| **interface** | (Optional) Specifies the interface for which to show information. |
| *type* | Interface type. For more information, use the question mark (?) online help function. |
| *interface-path-id* | Physical interface or virtual interface.<br>**Note** Use the **show interfaces** command to see a list of all interfaces currently configured on the router.<br>For more information about the syntax for the router, use the question mark (**?**) online help function. |
| **destination** *ip-address* | (Optional) Displays the BFD session destined for the specified IP address. |
| **detail** | (Optional) Displays detailed session information, including statistics and number of state transitions. |
| **in-label** | (Optional) Displays the BFD session with a specific incoming MPLS-TP label. |
| **location** *node-id* | (Optional) Displays BFD sessions hosted from the specified location. The *node-id* argument is entered in the *rack/slot/module* notation. |

## Command Default

The default is the default address family identifier (AFI) that is set by the **set default-afi** command, IPv4 or IPv6.

## Command Modes

EXEC

## Command History

| Release | Modification |
|---|---|
| Release 3.7.2 | This command was introduced. |

| Release | Modification |
|---|---|
| Release 4.0.0 | Support for the **ipv6** keyword was added. |
| Release 4.2.0 | Support for the **singlehop** and **multihop** keywords were added. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

For the *interface-path-id* argument, use the following guidelines:

- If specifying a physical interface, the naming notation is *rack*/*slot*/*module*/*port*. The slash between values is required as part of the notation. An explanation of each component of the naming notation is as follows:
  - *rack*: Chassis number of the rack.
  - *slot*: Physical slot number of the line card.
  - *module*: Module number. A physical layer interface module (PLIM) is always 0.
  - *port*: Physical port number of the interface.
- If specifying a virtual interface, the number range varies, depending on interface type.
- The BFD UP time in the show output printed using CLI, and the show output from SNMP may differ. The CLI output is the appropriate value. The difference doesn't impact the functioning of the device.

**Note** Only VRF ID is displayed in the summary CLI (such as **show bfd multiple-path**, **show bfd all session**, **show bfd counters**) and VRF name and VRF ID is displayed in the detailed CLI (such as **show bfd all session detail**, **show bfd all session status**).

## Task ID

| Task ID | Operations |
|---|---|
| bgp | read |
| ospf | read |
| isis | read |
| mpls-te | read |

## Examples

The following example shows the output from the **show bfd session** command with the **detail** keyword and IPv4 as the default:

```
RP/0/RSP0/CPU0:router# show bfd session detail

I/f:TenGigE0/2/0/0.6, Location:0/2/CPU0, dest:10.0.6.2, src:10.0.6.1
 State:UP for 0d:0h:3m:4s, number of times UP:1
Session type: PR/V4/SH
```

```
Received parameters:
 Version:1, desired tx interval:2 s, required rx interval:2 s
 Required echo rx interval:1 ms, multiplier:3, diag:None
 My discr:589830, your discr:590028, state UP, D/F/P/C/A:0/0/0/1/0
Transmitted parameters:
 Version:1, desired tx interval:2 s, required rx interval:2 s
 Required echo rx interval:1 ms, multiplier:3, diag:None
 My discr:590028, your discr:589830, state UP, D/F/P/C/A:0/0/0/1/0
Timer Values:
 Local negotiated async tx interval:2 s
 Remote negotiated async tx interval:2 s
 Desired echo tx interval:250 ms, local negotiated echo tx interval:250 ms
 Echo detection time:750 ms(250 ms*3), async detection time:6 s(2 s*3)
Local Stats:
 Intervals between async packets:
   Tx:Number of intervals=100, min=952 ms, max=2001 ms, avg=1835 ms
       Last packet transmitted 606 ms ago
   Rx:Number of intervals=100, min=1665 ms, max=2001 ms, avg=1828 ms
       Last packet received 1302 ms ago
 Intervals between echo packets:
   Tx:Number of intervals=100, min=250 ms, max=252 ms, avg=250 ms
       Last packet transmitted 188 ms ago
   Rx:Number of intervals=100, min=250 ms, max=252 ms, avg=250 ms
       Last packet received 187 ms ago
 Latency of echo packets (time between tx and rx):
   Number of packets:100, min=1 ms, max=2 ms, avg=1 ms
                          Desired               Adjusted
  Client               Interval   Multiplier Interval   Multiplier
  -------------------- ---------- ---------- ---------- ----------
  ipv4_static          500 ms     3          500 ms     3
  bgp-default          1500 ms    3          1500 ms    3
```

The following example shows the output from the **show bfd session** command with the **all** keyword, which displays both IPv4 and IPv6 information:

```
RP/0/RSP0/CPU0:router# show bfd all session location 0/1/CPU0

Mon Nov  5 08:51:50.339 UTC
IPv4:
-----
Interface            Dest Addr           Local det time(int*mult)      State
                                           Echo            Async
-------------------- --------------- ---------------- ---------------- ---------
PO0/1/0/0            10.0.0.2        300ms(100ms*3)   6s(2s*3)         UP

IPv6:
-----
Interface            Dest Addr
                     Local det time(int*mult)          State
                            Echo            Async
------------------- ----------------------------------------------
PO0/1/0/0            abcd::2
                     0s(0s*0)         15s(5s*3)        UP
```

***Table 4: show bfd session detail command Field Descriptions***

| Field | Description |
|---|---|
| I/f | Interface type. |

| Field | Description |
|---|---|
| Location | Location of the node that hosts the local endpoint of the connection, in the *rack/slot/module* notation |
| dest | IP address of the destination endpoint. |
| src | IP address of the source endpoint. |
| State | Current state of the connection, and the number of days, hours, minutes, and seconds that this connection has been active. |
| number of times UP | Number of times this connection has been brought up. |
| Received parameters | Provides information on the last transmitted control packet for the session:<br>• Version—Version number of the BFD protocol.<br>• desired tx interval—Desired transmit interval.<br>• required rx interval—Required receive interval.<br>• Required echo rx interval—Required echo receive interval.<br>• multiplier— Number of times a packets is missed before BFD declares the neighbor down.<br>• diag—diagnostic code specifying the peer system's reason for the last transition of the session from Up to some other state.<br>• My discr—unique, nonzero discriminator value generated by the transmitting system, used to demultiplex multiple BFD sessions between the same pair of systems.<br>• your discr— discriminator received from the corresponding remote system. This field reflects back the received value of My discr, or is zero if that value is unknown. |
| Transmitted parameters | Provides information on the last transmitted control packet for the session:<br>• Version—Version number of the BFD protocol.<br>• desired tx interval—Desired transmit interval.<br>• required rx interval—Required receive interval<br>• Required echo rx interval—Required echo receive interval<br>• multiplierNumber of times a packets is missed before BFD declares the neighbor down.<br>• diag—diagnostic code specifying the local system's reason for the last transition of the session from Up to some other state.<br>• My discr—unique, nonzero discriminator value generated by the transmitting system, used to demultiplex multiple BFD sessions between the same pair of systems.<br>• your discr— discriminator received from the corresponding remote system. This field reflects back the received value of My discr, or is zero if that value is unknown. |

| Field | Description |
|---|---|
| Timer Values | Provides information on the timer values used by the local and remote ends, as follows:<br>• Local negotiated async tx interval—interval at which control packets are being transmitted by the local end.<br>• Remote negotiated async tx interval—interval at which control packets should be transmitted by the remote end.<br>• Desired echo tx interval—interval at which the local end would like to transmit echo packets.<br>• local negotiated echo tx interval—interval at which echo packets are being transmitted by the local end.<br>• Echo detection time—local failure detection time of echo packets. It is the product of the local negotiated echo tx interval and the local multiplier.<br>• async detection time—local failure detection time of the asynchronous mode (control packets). It is the product of the remote negotiated async tx interval and the remote multiplier. |
| Local Stats | Displays the local transmit and receive statistics,<br>• Intervals between async packets—provides measurements on intervals between control packets (tx and rx):<br>  • Number of intervals—number of sampled intervals between control packets<br>  • min—minimum measured interval between 2 consecutive control packets<br>  • max—maximum measured interval between 2 consecutive control packets<br>  • avg—average measured interval between 2 consecutive control packets<br>  • Last packet received/transmitted—indicates how long ago the last control packet was received/transmitted.<br>• Intervals between echo packets—provides measurements on intervals between echo packets (tx and rx). The measurements have the same meaning as for async packets.<br>• Latency of echo packets (time between tx and rx)—provides measurements on latency of echo packets, i.e. the time between tx and rx of echo packets:<br>  • Number of packets—number of sampled echo packets.<br>  • min—minimum measured latency for echo packets.<br>  • max—maximum measured latency of echo packets.<br>  • avg—average measured latency of echo packets. |

| Field | Description |
|---|---|
| Session owner information | Provides the following information about the session owner.<br>• Client—name of the client application process.<br>• Desired interval—desired interval provided by the client, in milliseconds.<br>• Multiplier—multiplier value provided by the client. |

## Related Commands

| Command | Description |
|---|---|
| bfd fast-detect, on page 28 | Enables BFD to detect failures in the path between adjacent forwarding engines. |
| bfd multiplier, on page 38 | Sets the BFD multiplier. |
| show bfd mib session, on page 73 | Displays BFD MIB session information. |

# show bfd summary

To display the percentage of PPS rate in use per line card, maximum usage of PPS, and total number of sessions, use the **show bfd summary** command in the EXEC mode.

**show bfd summary** [**private**]**location***node-id*

## Syntax Description

| | |
|---|---|
| **private** | Displays the private information. |
| **location** *node-id* | Displays BFD counters from the specified location. The *node-id* argument is entered in the *rack/slot/module* notation. |

## Command Default

No default behavior or values

## Command Modes

EXEC

## Command History

| Release | Modification |
|---|---|
| Release 4.2.0 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

## Task ID

| Task ID | Operation |
|---|---|
| bgp | read |
| ospf | read |
| isis | read |
| mpls-te | read |

### Example

This example shows the sample output from the **show bfd summary** command for a specified location:

```
RP/0/RSP0/CPU0:router#show bfd summary location 0/1/cpu0

Node       PPS rate usage  Session number
           %   Used  Max   Total   Max
---------- --------------- --------------
0/1/CPU0   0   80    9600  4       4000
```

This example shows the sample output from the **show bfd summary** command:

```
RP/0/RSP0/CPU0:router#show bfd summary
Node       PPS rate usage  Session number
           %   Used  Max   Total   Max
---------- --------------- --------------
0/0/CPU0   0   0     9600  0       4000
0/1/CPU0   0   0     9600  0       4000
0/2/CPU0   0   0     9600  0       4000
0/5/CPU0   0   0     9600  0       4000
0/6/CPU0   0   0     9600  0       4000
0/7/CPU0   0   0     9600  0       4000
```