



## Implementing BFD

Bidirectional forwarding detection (BFD) provides low-overhead, short-duration detection of failures in the path between adjacent forwarding engines. BFD allows a single mechanism to be used for failure detection over any media and at any protocol layer, with a wide range of detection times and overhead. The fast detection of failures provides immediate reaction to failure in the event of a failed link or neighbor.



**Tip** You can programmatically configure BFD and retrieve operational data using `openconfig-bfd.yang` OpenConfig data model. To get started with using data models, see the .

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## BFD over Bundle and BFD over Logical Bundle

Link Aggregation Control Protocol (LACP) allows a network device to negotiate an automatic bundling of links by sending LACP packets to their directly connected peer. LACP provides a keep-alive mechanism for the link members. While the default keep-alive is 30s, it is configurable to up to 1s. LACP can detect failures on a per-physical-member link. However, the LACP timers do not fulfill the criteria of current fast convergence requirements.

### Differences between BFD over Bundle and BFD over Logical Bundle

BFD over Bundle (BoB) (RFC 7130) has a BFD session on each bundle member. The client is the bundle manager. If a BFD session goes down on a specific member link, the whole bundle interface goes down. That is, when the member link goes down, the number of available links falls below the required minimum. Hence the routing session is brought down.

BFD over Logical Bundle (BLB) (RFC 5880) treats a bundle interface with all its members as a single interface. BLB is a multipath (MP) single-hop session. If BLB is configured on a bundle there is only one single BFD session that is active. This implies that only one bundle member is being monitored by BFD at any given time. The client is one of the routing protocols. When BFD detects a failure, the client brings down the routing session.

The mode (BoB or BLB) is determined by how you configure BFD:

- You can enable BoB by configuring BFD under a Bundle-Ether interface.
- You can enable BLB by configuring BFD under a Bundle-Ether interface on a routing client.

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## Enabling BFD Sessions on Bundle Members

To enable BFD sessions on bundle member links, complete these steps:

### SUMMARY STEPS

1. **configure**
2. **interface Bundle-Ether** *bundle-id*
3. **bfd address-family ipv4 fast-detect**
4. Use the **commit** or **end** command.

### DETAILED STEPS

	Command or Action	Purpose
<b>Step 1</b>	<b>configure</b>  <b>Example:</b>  RP/0/# <code>configure</code>	Enters mode.
<b>Step 2</b>	<b>interface Bundle-Ether</b> <i>bundle-id</i>  <b>Example:</b>  RP/0/(config)# <code>interface Bundle-Ether 1</code>	Enters interface configuration mode for the specified bundle ID.
<b>Step 3</b>	<b>bfd address-family ipv4 fast-detect</b>  <b>Example:</b>  RP/0/(config-if)# <code>bfd address-family ipv4 fast-detect</code>	Enables IPv4 BFD sessions on bundle member links.
<b>Step 4</b>	Use the <b>commit</b> or <b>end</b> command.	<b>commit</b> —Saves the configuration changes and remains within the configuration session.  <b>end</b> —Prompts user to take one of these actions: <ul style="list-style-type: none"> <li>• <b>Yes</b> — Saves configuration changes and exits the configuration session.</li> </ul>

	Command or Action	Purpose
		<ul style="list-style-type: none"> <li>• <b>No</b> —Exits the configuration session without committing the configuration changes.</li> <li>• <b>Cancel</b> —Remains in the configuration session, without committing the configuration changes.</li> </ul>

## Specifying the BFD Destination Address on a Bundle

To specify the BFD destination address on a bundle, complete these steps:

### SUMMARY STEPS

1. **configure**
2. **interface Bundle-Ether** *bundle-id*
3. **bfd address-family ipv4 destination** *ip-address*
4. Use the **commit** or **end** command.

### DETAILED STEPS

	Command or Action	Purpose
<b>Step 1</b>	<b>configure</b> <b>Example:</b> RP/0/# <code>configure</code>	Enters mode.
<b>Step 2</b>	<b>interface Bundle-Ether</b> <i>bundle-id</i> <b>Example:</b> RP/0/(config)# <code>interface Bundle-Ether 1</code>	Enters interface configuration mode for the specified bundle ID.
<b>Step 3</b>	<b>bfd address-family ipv4 destination</b> <i>ip-address</i> <b>Example:</b> RP/0/(config-if)# <code>bfd address-family ipv4 destination 10.20.20.1</code>	Specifies the primary IPv4 address assigned to the bundle interface on a connected remote system, where <i>ip-address</i> is the 32-bit IP address in dotted-decimal format (A.B.C.D).
<b>Step 4</b>	Use the <b>commit</b> or <b>end</b> command.	<b>commit</b> —Saves the configuration changes and remains within the configuration session. <b>end</b> —Prompts user to take one of these actions: <ul style="list-style-type: none"> <li>• <b>Yes</b> — Saves configuration changes and exits the configuration session.</li> <li>• <b>No</b> —Exits the configuration session without committing the configuration changes.</li> </ul>

	Command or Action	Purpose
		<ul style="list-style-type: none"> <li>• <b>Cancel</b> —Remains in the configuration session, without committing the configuration changes.</li> </ul>

## Configuring the Minimum Thresholds for Maintaining an Active Bundle

The bundle manager uses two configurable minimum thresholds to determine whether a bundle can be brought up or remain up, or is down, based on the state of its member links.

- Minimum active number of links
- Minimum active bandwidth available

Whenever the state of a member changes, the bundle manager determines whether the number of active members or available bandwidth is less than the minimum. If so, then the bundle is placed, or remains, in DOWN state. Once the number of active links or available bandwidth reaches one of the minimum thresholds, then the bundle returns to the UP state.

To configure minimum bundle thresholds, complete these steps:

### SUMMARY STEPS

1. **configure**
2. **interface Bundle-Ether** *bundle-id*
3. **bundle minimum-active bandwidth** *kbps*
4. **bundle minimum-active links** *links*
5. Use the **commit** or **end** command.

### DETAILED STEPS

	Command or Action	Purpose
<b>Step 1</b>	<b>configure</b> <b>Example:</b> RP/0/# configure	Enters mode.
<b>Step 2</b>	<b>interface Bundle-Ether</b> <i>bundle-id</i> <b>Example:</b> RP/0/(config)# interface Bundle-Ether 1	Enters interface configuration mode for the specified bundle ID.
<b>Step 3</b>	<b>bundle minimum-active bandwidth</b> <i>kbps</i> <b>Example:</b> RP/0/(config-if)# bundle minimum-active bandwidth 580000	Sets the minimum amount of bandwidth required before a bundle can be brought up or remain up. The range is from 1 through a number that varies depending on the platform and the bundle type.

	Command or Action	Purpose
Step 4	<b>bundle minimum-active links</b> <i>links</i> <b>Example:</b> <pre>RP/0/(config-if)# bundle minimum-active links 2</pre>	Sets the number of active links required before a bundle can be brought up or remain up. The range is from 1 to 32.  <b>Note</b> When BFD is started on a bundle that is already active, the BFD state of the bundle is declared when the BFD state of all the existing active members is known.
Step 5	Use the <b>commit</b> or <b>end</b> command.	<b>commit</b> —Saves the configuration changes and remains within the configuration session.  <b>end</b> —Prompts user to take one of these actions: <ul style="list-style-type: none"> <li>• <b>Yes</b> — Saves configuration changes and exits the configuration session.</li> <li>• <b>No</b> —Exits the configuration session without committing the configuration changes.</li> <li>• <b>Cancel</b> —Remains in the configuration session, without committing the configuration changes.</li> </ul>

## Configuring BFD Packet Transmission Intervals and Failure Detection Times on a Bundle

BFD asynchronous packet intervals and failure detection times for BFD sessions on bundle member links are configured using a combination of the **bfd address-family ipv4 minimum-interval** and **bfd address-family ipv4 multiplier** interface configuration commands on a bundle.

The BFD control packet interval is configured directly using the **bfd address-family ipv4 minimum-interval** command. The failure detection times are determined by a combination of the interval and multiplier values in these commands.

To configure the minimum transmission interval and failure detection times for BFD asynchronous mode control packets on bundle member links, complete these steps:

### SUMMARY STEPS

1. **configure**
2. **interface Bundle-Ether** *bundle-id*
3. **bfd address-family ipv4 minimum-interval** *milliseconds*
4. **bfd address-family ipv4 multiplier** *multiplier*
5. Use the **commit** or **end** command.

## DETAILED STEPS

	Command or Action	Purpose
<b>Step 1</b>	<b>configure</b> <b>Example:</b> <pre>RP/0/# configure</pre>	Enters mode.
<b>Step 2</b>	<b>interface Bundle-Ether <i>bundle-id</i></b> <b>Example:</b> <pre>RP/0/(config)# interface Bundle-Ether 1</pre>	Enters interface configuration mode for the specified bundle ID.
<b>Step 3</b>	<b>bfd address-family ipv4 minimum-interval <i>milliseconds</i></b> <b>Example:</b> <pre>RP/0/(config-if)#bfd address-family ipv4 minimum-interval 2000</pre> <p><b>Note</b> Specifies the minimum interval, in milliseconds, for asynchronous mode control packets on IPv4 BFD sessions on bundle member links. The range is from 4 to 30000.</p>	
<b>Step 4</b>	<b>bfd address-family ipv4 multiplier <i>multiplier</i></b> <b>Example:</b> <pre>RP/0/(config-if)#bfd address-family ipv4 multiplier 30</pre>	<p>Specifies a number that is used as a multiplier with the minimum interval to determine BFD control packet failure detection times and transmission intervals for IPv4 BFD sessions on bundle member links. The range is from 2 to 50. The default is 3.</p> <p><b>Note</b> Although the command allows you to configure a minimum of 2, the supported minimum is 3.</p>
<b>Step 5</b>	Use the <b>commit</b> or <b>end</b> command.	<p><b>commit</b> —Saves the configuration changes and remains within the configuration session.</p> <p><b>end</b> —Prompts user to take one of these actions:</p> <ul style="list-style-type: none"> <li>• <b>Yes</b> — Saves configuration changes and exits the configuration session.</li> <li>• <b>No</b> —Exits the configuration session without committing the configuration changes.</li> <li>• <b>Cancel</b> —Remains in the configuration session, without committing the configuration changes.</li> </ul>

# Configure BFD over Bundles IETF Mode Support on a Per Bundle Basis

To configure BFD over Bundles IETF mode support on a per bundle basis use these steps:

## SUMMARY STEPS

1. **configure**
2. **interface Bundle-Ether *bundle-id***
3. **bfd mode ietf**
4. **bfd address-family ipv4 fast-detect**
5. Use the **commit** or **end** command.
6. **show bundle bundle-ether *bundle-id***

## DETAILED STEPS

	Command or Action	Purpose
<b>Step 1</b>	<b>configure</b> <b>Example:</b> RP/0/# configure	Enters mode.
<b>Step 2</b>	<b>interface Bundle-Ether <i>bundle-id</i></b> <b>Example:</b> RP/0/(config)# interface Bundle-Ether 1	Enters interface configuration mode for the specified bundle ID.
<b>Step 3</b>	<b>bfd mode ietf</b> <b>Example:</b> RP/0/(config-if)# bfd mode ietf	Enables IETF mode for BFD over bundle for the specified bundle.
<b>Step 4</b>	<b>bfd address-family ipv4 fast-detect</b> <b>Example:</b> RP/0/(config-if)# bfd address-family ipv4 fast-detect	Enables IPv4 BFD sessions on the specified bundle.
<b>Step 5</b>	Use the <b>commit</b> or <b>end</b> command.	<b>commit</b> —Saves the configuration changes and remains within the configuration session. <b>end</b> —Prompts user to take one of these actions: <ul style="list-style-type: none"> <li>• <b>Yes</b> — Saves configuration changes and exits the configuration session.</li> <li>• <b>No</b> —Exits the configuration session without committing the configuration changes.</li> </ul>

	Command or Action	Purpose
		<ul style="list-style-type: none"><li>• <b>Cancel</b> —Remains in the configuration session, without committing the configuration changes.</li></ul>
<b>Step 6</b>	<b>show bundle bundle-ether</b> <i>bundle-id</i>	Displays the selected bundle mode.