CHAPTER 21

Configuring Bidirectional Forwarding Detection

Bidirectional Forwarding Detection (BFD) provides a low-overhead, short-duration method of detecting failures in the forwarding path between two adjacent routers, including the interfaces, data links, and forwarding planes. BFD is a detection protocol that you enable at the interface and routing protocol levels.

The following sections describe how to configure BFD on the Cisco MWR 2941:

Understanding BFD

Cisco supports the BFD asynchronous mode, in which two routers exchange BFD control packets to activate and maintain BFD neighbor sessions. To create a BFD session, you must configure BFD on both systems (or BFD peers). After you have enabled BFD on the interface and the router level for the appropriate routing protocols, a BFD session is created, BFD timers are negotiated, and the BFD peers begin to send BFD control packets to each other at the negotiated interval.

Configuring BFD

The following sections describe how to configure BFD for each routing protocol:

For more information about BFD, refer to the *IP Routing: BFD Configuration Guide, Cisco IOS Release 15.0S*. For a sample BFD configurations, see Configuration Examples for BFD.

Configuring BFD for OSPF

This section describes how to configure BFD on the Cisco MWR 2941.

Configuring BFD for OSPF on One of More Interfaces

Follow these steps to configure BFD for OSPF on a single interface.

	Command	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	`Router(config)# interface vlan1` `Router(config-if)#`	Specifies an interface to configure.
Step 4	`Router(config-if)# ip ospf bfd`	Enables BFD for OSPF on the interface.
Step 5	`Router(config-if)# bfd interval 50 min_rx 50 multiplier 3`	Specifies the BFD session parameters.

Step 6	**end**
	
	Example:
	`Router(config-if)# end`
	`Router#`
		Exits configuration mode.

Note You can also use the **show bfd neighbors** and **show ip ospf** commands to display troubleshooting information about BFD and OSPF.

Configuring BFD for OSPF on All Interfaces

Follow these steps to configure BFD for OSPF on all interfaces.

	Command	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	`Router(config)#` **router ospf 100**	Creates a configuration for an OSPF process.
Step 4	`Router(config)#` **bfd all-interfaces**	Enables BFD globally on all interfaces associated with the OSPF routing process.

Step 5	**exit**
	
	Example:
	`Router(config)# exit`
	`Router#`
		Exits configuration mode.

Note You can disable BFD on a single interface using the **ip ospf bfd disable** command when configuring the relevant interface.

Configuring BFD for BGP

Follow these steps to configure BFD for BGP.

	Command	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	`Router(config)#` **router bgp** *as-tag*	Specifies a BGP process and enter router configuration mode.
Step 4	`Router(config)#` **neighbor** *ip-address* **fall-over bfd**	Enables support for BFD failover.

	Command	Purpose

Step 5	**exit**
	
	Example:
	`Router(config)# exit`
	`Router#`
		Exits configuration mode.

Step 6	**show bfd neighbors [details]** **show ip bgp neighbor**	Use the following commands to verify the BFD configuration: • **show bfd neighbors [details]** —Verifies that the BFD neighbor is active and displays the routing protocols that BFD has registered. • **show ip bgp neighbor**—Displays information about BGP and TCP connections to neighbors.

Configuring BFD for IS-IS

This section describes how to configure BFD for IS-IS routing.

Configuring BFD for IS-IS on a Single Interface

Follow these steps to configure BFD for IS-IS on a single interface.

	Command	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	`Router(config)# interface vlan1` `Router(config-if)#`	Enters interface configuration mode.
Step 4	`Router(config-if) ip router isis [tag]`	Enables support for IPv4 routing on the interface.

Step 5	**exit**
	
	Example:
	`Router(config)# exit`
	`Router#`
		Exits configuration mode.

Note You can use the **show bfd neighbors** and **show clns interface** commands to verify your configuration.

Configuring BFD for IS-IS for All Interfaces

Follow these steps to configure BFD for IS-IS on all interfaces.

	Command	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	`Router(config)# interface vlan1` `Router(config-if)#`	Enters interface configuration mode.
Step 4	`Router(config-if) ip router isis [tag]`	Enables support for IPv4 routing on the interface.
Step 5	`Router(config-router)# bfd all-interfaces`	Enables BFD globally on all interfaces associated with the IS-IS routing process.
Step 6	`Router(config-router)# exit` `Router(config)#`	Exits the interface.

Step 7	`Router(config)# interface vlan1`
	`Router(config-if) ip router isis [tag]`
	`Router(config-if)# isis bfd`
		If you want to enable BFD on a per-interface basis for one or more interfaces associated with the IS-IS routing process, complete the following steps:
		a. Use the **interface** command to enter interface configuration mode.
		b. Use the **ip router isis** command to enables support for IPv4 routing on the interface.
		c. Use the **isis bfd** command to enable BFD on the interface.

Step 8	**exit**
	
	Example:
	`Router(config)# exit`
	`Router#`
		Exit configuration mode.

Note You can use the **show bfd neighbors** and **show clns interface** commands to verify your configuration.

Configuring BFD for Static Routes

Follow these steps to configure BFD for static routes.

	Command	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	`Router(config)# interface serial 2/0`	Specifies an interface and enters interface configuration mode.
Step 4	`Router(config-if)# ip address 10.201.201.1 255.255.255.0`	Configures an IP address for the interface.
Step 5	`Router(config-if)# bfd interval 500 min_rx 500 multiplier 5`	Enables BFD on the interface.
Step 6	`Router(config-if)# ip route static bfd Serial 2/0 10.201.201.2`	Specifies a static route BFD neighbor.

Step 7	**exit**
	
	Example:
	`Router(config)# exit`
	`Router#`
		Exits configuration mode.

Note You can use the **show ip static route** command to verify your configuration.

Configuration Examples for BFD

The following section contains sample configurations for each routing protocol using BFD.

- OSPF with BFD, page 21-6
- BGP with BFD, page 21-10
- IS-IS with BFD, page 21-13

For more information about how to configure routing on the Cisco MWR 2941, see Chapter 20, "Configuring Routing Protocols."

OSPF with BFD

```
!
version 12.4
service timestamps debug datetime msec
```

```
service timestamps log datetime msec
no service password-encryption
!
hostname BFD2941
!
boot-start-marker
boot-end-marker
!
card type t1 0 0
logging buffered 1000000
no logging console
!
no aaa new-model
ip source-route
!
!
ip cef
no ip domain lookup
ip host tftp 64.102.116.25
ptp mode ordinary
ptp priority1 128
ptp priority2 128
ptp domain 0
multilink bundle-name authenticated
!
archive
 log config
  hidekeys
!
controller T1 0/0
 mode atm
 clock source line
!
controller T1 0/1
 clock source line
 cem-group 0 timeslots 1-31
!
controller T1 0/2
 clock source internal
!
controller T1 0/3
 clock source internal
!
controller T1 0/4
 clock source internal
!
controller T1 0/5
 clock source internal
!
controller T1 0/6
 clock source internal
!
controller T1 0/7
 clock source internal
!
controller T1 0/8
 clock source internal
!
controller T1 0/9
 clock source internal
!
controller T1 0/10
 clock source internal
!
```

```
controller T1 0/11
 clock source internal
!
controller T1 0/12
 clock source internal
!
controller T1 0/13
 clock source internal
!
controller T1 0/14
 clock source internal
!
controller T1 0/15
 clock source internal
!
controller BITS
  applique E1
!
!
interface Loopback0
 ip address 88.88.88.150 255.255.255.255
!
interface GigabitEthernet0/0
 switchport trunk allowed vlan 1-9,11-4094
 switchport mode trunk
!
interface GigabitEthernet0/1
!
interface GigabitEthernet0/2
 switchport access vlan 10
!
interface GigabitEthernet0/3
!
interface GigabitEthernet0/4
!
interface GigabitEthernet0/5
!
interface ATM0/0
 no ip address
 scrambling-payload
 atm pvp 1 l2transport
  xconnect 10.10.10.2 10001 encapsulation mpls
 no atm ilmi-keepalive
 pvc 0/20 l2transport
  vc-hold-queue 80
  encapsulation aal0
  xconnect 10.10.10.2 10020 encapsulation mpls
 !
 pvc 0/30 l2transport
  encapsulation aal5
  xconnect 10.10.10.2 10030 encapsulation mpls
 !
 pvc 0/40
  vc-hold-queue 50
  encapsulation aal5snap
 !
!
interface CEM0/1
 no ip address
 cem 0
  xconnect 10.10.10.2 222 encapsulation mpls
 !
!
interface Vlan1
```

```
 no ip address
 shutdown
 no ptp enable
!
interface Vlan10
 ip address 192.168.52.88 255.255.255.0
 no ptp enable
!
interface Vlan100
 description Primary EVC
 ip address 172.22.41.2 255.255.255.0
 ip ospf cost 4
 ip ospf hello-interval 1
 ip ospf dead-interval 3
 no ptp enable
 mpls ip
 bfd interval 50 min_rx 50 multiplier 3
!
interface Vlan200
 description Secondary EVC
 ip address 172.22.42.2 255.255.255.0
 ip ospf cost 5
 ip ospf hello-interval 1
 ip ospf dead-interval 3
 no ptp enable
 mpls ip
!
router ospf 100
 router-id 88.88.88.150
 log-adjacency-changes
 timers throttle spf 50 50 1000
 timers throttle lsa all 0 25 10000
 timers lsa arrival 0
 timers pacing flood 20
 timers pacing retransmission 30
 redistribute static subnets
 network 88.88.88.150 0.0.0.0 area 0
 network 172.22.41.0 0.0.0.255 area 0
 network 172.22.42.0 0.0.0.255 area 0
 bfd all-interfaces
!
ip default-gateway 192.168.52.1
ip forward-protocol nd
ip route 0.0.0.0 0.0.0.0 192.168.52.1
ip route 64.102.116.25 255.255.255.255 192.168.52.1
!
!
ip http server
no ip http secure-server
!
control-plane
!
line con 0
 exec-timeout 0 0
 no modem enable
line aux 0
line vty 0 4
 exec-timeout 0 0
 privilege level 15
 password xxxxx
 login
!
exception data-corruption buffer truncate
network-clock-select hold-timeout infinite
```

```
network-clock-select mode nonrevert
network-clock-select 1 E1 0/0
end
```

BGP with BFD

```
!
version 12.4
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname BFD2941
!
boot-start-marker
boot-end-marker
!
card type t1 0 0
logging buffered 1000000
no logging console
!
no aaa new-model
ip source-route
!
!
ip cef
no ip domain lookup
ip host tftp 64.102.116.25
ptp mode ordinary
ptp priority1 128
ptp priority2 128
ptp domain 0
multilink bundle-name authenticated
!
archive
 log config
  hidekeys
!
controller T1 0/0
 mode atm
 clock source line
!
controller T1 0/1
 clock source line
 cem-group 0 timeslots 1-31
!
controller T1 0/2
 clock source internal
!
controller T1 0/3
 clock source internal
!
controller T1 0/4
 clock source internal
!
controller T1 0/5
 clock source internal
!
controller T1 0/6
 clock source internal
!
```

```
controller T1 0/7
 clock source internal
!
controller T1 0/8
 clock source internal
!
controller T1 0/9
 clock source internal
!
controller T1 0/10
 clock source internal
!
controller T1 0/11
 clock source internal
!
controller T1 0/12
 clock source internal
!
controller T1 0/13
 clock source internal
!
controller T1 0/14
 clock source internal
!
controller T1 0/15
 clock source internal
!
controller BITS
  applique E1
!
interface Loopback0
 ip address 20.20.20.20 255.255.255.255
!
interface GigabitEthernet0/2
 switchport access vlan 10
 load-interval 30
 duplex full
 speed 100
!
interface GigabitEthernet0/3
 switchport access vlan 200
 load-interval 30
 duplex full
 speed 100
!
interface GigabitEthernet0/4
 switchport access vlan 4
 load-interval 30
 duplex full
 speed 100
!
interface GigabitEthernet0/5
 switchport access vlan 100
 load-interval 30
 duplex full
 speed 100
!
interface ATM0/0
 no ip address
 scrambling-payload
 atm bandwidth dynamic
 pvc 0/100 l2transport
  !
!
```

```
interface ATM0/0.1 multipoint
 pvc 1/5 l2transport
  encapsulation aal0
  xconnect 10.10.10.10 10010 encapsulation mpls
 !
 pvc 1/6 l2transport
  encapsulation aal5
  xconnect 10.10.10.10 10020 encapsulation mpls
!
!
interface ATM0/0.2 multipoint
 xconnect 10.10.10.10 10030 encapsulation mpls
 pvc 2/5 l2transport
  encapsulation aal0
 !
 pvc 2/6 l2transport
  encapsulation aal0
 !
!
interface ATM0/1
 no ip address
 scrambling-payload
 no atm ilmi-keepalive
 pvc 0/100 l2transport
 !
!
interface Vlan4 (connected to 7600)
 ip address 11.1.1.2 255.255.255.0
 no ptp enable
 bfd interval 50 min_rx 50 multiplier 3
!
interface Vlan10
 ip address 192.168.40.61 255.255.255.128
 no ptp enable
 mpls ip
!
interface Vlan100
 ip address 12.1.1.2 255.255.255.0
 no ptp enable
 mpls bgp forwarding
 mpls ip
 bfd interval 50 min_rx 50 multiplier 3
!
interface Vlan200
 ip address 12.1.2.2 255.255.255.0
 no ptp enable
 mpls bgp forwarding
 mpls ip
 bfd interval 50 min_rx 50 multiplier 3
!
router bgp 200
 no synchronization
 bgp log-neighbor-changes
 network 11.1.1.0
 network 12.1.1.0
 network 12.1.2.0
 redistribute connected
 neighbor 11.1.1.1 remote-as 100
 neighbor 11.1.1.1 fall-over bfd
 neighbor 11.1.1.1 send-label
 neighbor 12.1.1.1 remote-as 300
 neighbor 12.1.1.1 fall-over bfd
 neighbor 12.1.1.1 send-label
 neighbor 12.1.2.1 remote-as 300
```

```
 neighbor 12.1.2.1 fall-over bfd
 neighbor 12.1.2.1 send-label
 no auto-summary
!
connect atmcellsw ATM0/0 0/100 ATM0/1 0/100
 !
!
mpls ldp router-id Loopback0 force
!
```

IS-IS with BFD

```
!
version 12.4
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname BFD2941
!
boot-start-marker
boot-end-marker
!
card type t1 0 0
logging buffered 1000000
no logging console
!
no aaa new-model
ip source-route
!
!
ip cef
no ip domain lookup
ip host tftp 64.102.116.25
ptp mode ordinary
ptp priority1 128
ptp priority2 128
ptp domain 0
multilink bundle-name authenticated
!
archive
 log config
  hidekeys
!
controller T1 0/0
 mode atm
 clock source line
!
controller T1 0/1
 clock source line
 cem-group 0 timeslots 1-31
!
controller T1 0/2
 clock source internal
!
controller T1 0/3
 clock source internal
!
controller T1 0/4
 clock source internal
!
```

```
controller T1 0/5
 clock source internal
!
controller T1 0/6
 clock source internal
!
controller T1 0/7
 clock source internal
!
controller T1 0/8
 clock source internal
!
controller T1 0/9
 clock source internal
!
controller T1 0/10
 clock source internal
!
controller T1 0/11
 clock source internal
!
controller T1 0/12
 clock source internal
!
controller T1 0/13
 clock source internal
!
controller T1 0/14
 clock source internal
!
controller T1 0/15
 clock source internal
!
controller BITS
  applique E1
!
interface Loopback0
 ip address 20.20.20.20 255.255.255.255
!
interface GigabitEthernet0/2
 switchport access vlan 10
 load-interval 30
 duplex full
 speed 100
!
interface GigabitEthernet0/3
 switchport access vlan 200
 load-interval 30
 duplex full
 speed 100
!
interface GigabitEthernet0/4
 switchport access vlan 4
 load-interval 30
 duplex full
 speed 100
!
interface GigabitEthernet0/5
 switchport access vlan 100
 load-interval 30
 duplex full
 speed 100
!
interface ATM0/0
```

```
 no ip address
 scrambling-payload
 atm bandwidth dynamic
pvc 0/100 l2transport
 !
!
interface ATM0/0.1 multipoint
 pvc 1/5 l2transport
  encapsulation aal0
  xconnect 10.10.10.10 10010 encapsulation mpls
 !
 pvc 1/6 l2transport
  encapsulation aal5
  xconnect 10.10.10.10 10020 encapsulation mpls
 !
!
interface ATM0/0.2 multipoint
 xconnect 10.10.10.10 10030 encapsulation mpls
 pvc 2/5 l2transport
  encapsulation aal0
 !
 pvc 2/6 l2transport
  encapsulation aal0
 !
!
interface ATM0/1
 no ip address
 scrambling-payload
 no atm ilmi-keepalive
 pvc 0/100 l2transport
 !
!
interface Vlan4
 ip address 11.1.1.2 255.255.255.0
 ip router isis test_ip_isis
 no ptp enable
 isis bfd
!
interface Vlan10
 ip address 192.168.40.61 255.255.255.128
 no ptp enable
 mpls ip
!
interface Vlan100
 ip address 12.1.1.2 255.255.255.0
 ip router isis test_ip_isis
 no ptp enable
 mpls ip
 bfd interval 50 min_rx 50 multiplier 3
 isis bfd
!
interface Vlan200
 ip address 12.1.2.2 255.255.255.0
 ip router isis test_ip_isis
 no ptp enable
 mpls ip
 bfd interval 50 min_rx 50 multiplier 3
 isis bfd
!
router isis test_ip_isis
 net 47.0004.004d.0055.0000.0c00.0002.00
 net 47.0004.004d.0056.0000.0c00.0002.00
 is-type level-2-only
 redistribute connected
```

```
 bfd all-interfaces
!
```