Configuring Microwave 1+1 Hot Standby Protocol on the Cisco ASR 903 Series Router

Note This chapter is not applicable for Cisco ASR 900 RSP3 Module.

The following sections describe the Microwave 1+1 Hot Standby (HSBY) Protocol:

Overview of Microwave 1+1 Hot Standby Protocol

Microwave 1+1 Hot Standby Protocol (HSBY) is a link protection protocol developed by Nokia Siemens Networks. HSBY extends the functionality of CFM Continuity Check messages to enable detection and handling of hardware failures in microwave devices in order to provide redundancy. HSBY provides link protection support for indoor units (IDUs) and outdoor units (ODUs).

Suspending Continuity Check Messages

Under some circumstances such as a software upgrade or a device reload, it is necessary to temporarily suspend continuity check messages between the ODU and IDU in order to prevent unnecessary link protection action such as a failover. In this case, the ODU sets a suspend flag within the continuity check messages sent to the IDU indicating the amount of time until continuity check messages resume. The IDU resumes exchanging continuity check messages with the ODU after the suspend interval has passed or after the ODU recovers sends a continuity check message.

Note While the Cisco ASR 903 Series Router processes continuity check suspend messages from the IDU, configuration of continuity check messages on the Cisco ASR 903 Series Router is not supported.

Restrictions for CFM CCM Extensions to Support the NSN Microwave 1+1 HSBY Protocol

- To enable link-protection on a maintenance endpoint (MEP), the connectivity fault management (CFM) domain and MEP must adhere to the Nokia Siemens Networks (NSN) configuration requirements.

NSN Microwave 1+1 HSBY and CFM Integration

Monitoring Devices and Suspending CFM Traffic

The NSN Microwave 1+1 HSBY Protocol has specified a proprietary time-to-live (TLV) field in CCMs for monitoring active and standby ODUs, and a flag to temporarily suspend CCM monitoring. Identified by an Organizational Unique Identifier (OUI) value of 0x000FBB, the TLV is attached to CCMs as an organization-specific TLV.

An IDU or an ODU may need to temporarily halt transmitting traffic, including CCMs, in circumstances such as a software upgrade or a reload. An IDU or ODUs can set the Suspend CC Monitor flag to signal a temporary pause in CFM traffic if a suspension is needed. Using this flag prevents the other two devices from triggering an unnecessary link-protection action. The Suspend CC Monitor time interval field, in conjunction with the flag, indicates the maximum amount of time the two devices must wait before expecting CCMs to resume from the suspended device.

HSBY Maintenance Associations

HSBY protocol uses two types of CFM continuity check messages:

- E–CCM—An IDU-to-ODU continuity check message that functions at Ethernet CFM domain level 0. There are two active E–CCM sessions when HSBY is configured.

- P–CCM—An ODU-to-ODU continuity check message that functions at Ethernet CFM domain level 4.

Note   The IDU is only associated with the E–CCM sessions; it has outward-facing MEPs configured for each session.

Thus, the HSBY configuration shown in figure below consists of five separate traffic flows:

- CFM traffic between the IDU and ODU 1

- CFM traffic between the IDU and the ODU 2

- CFM traffic between ODU 1 and ODU 2. This traffic passes through IDU.

- Data traffic between the WAN and ODU 1. This traffic passes through the IDU.

Configuring Microwave 1+1 Hot Standby Protocol

The following sections describe how to configure Microwave 1+1 Hot Standby Protocol (HSBY) on the Cisco ASR 903 Series Router.

Configuring ODU Values

HSBY protocol specifies that some values on the ODU are configurable while others utilize fixed values. Table below summarizes the permitted values for an ODU using HSBY protocol.

Table 1: HSBY ODU Configuration Parameters Summary

Parameter	Default Value	Permitted Values
Short MA Name	Learned	0–65535
MPID	2	Fixed
MA VLAN-ID (P-CCM)	None	16–50

Configuring IDU Values

HSBY protocol specifies that some values on the IDU are configurable while others utilize fixed values. Table below summarizes the permitted values for an IDU using HSBY protocol.

Table 2: HSBY IDU Configuration Parameters Summary

Parameter	Default Value	Permitted Values
CC Interval	100 ms	10 ms, 100 ms, and 1000 ms
Domain Level	0	Fixed
Domain Name	Null	Fixed
MA VLAN-ID (E-CCM)	None	1–15
MPID	1	Fixed
Short MA Name	None	0–65535
Suspend Interval	160 seconds	80 s, 160 s, 240 s, and 320 s

Configuring HSBY

SUMMARY STEPS

1. **enable**
2. **configure terminal**

3. **ethernet cfm global**
4. **link-protection enable**
5. **link-protection group management vlan** *vlan-id*
6. **link-protection suspend-interval interval** *interval*
7. **link-protection group** *group-number* **pccm vlan** *vlan-id*
8. **ethernet cfm domain** *domain-name* **level** *level-id* [**direction outward**]
9. **id null**
10. **service** {*ma-name* | *ma-num* | *vlan-id vlan-id* | *vpn-id vpn-id*} [**port** | **vlan** *vlan-id* [**direction down**]]
11. **mep mpid** *mpid*
12. **continuity-check** [**interval** *time* | **loss-threshold** *threshold* | **static rmep**]
13. **exit**
14. **exit**
15. **ethernet cfm domain** *domain-name* **level** *level-id* [**direction outward**]
16. **id null**
17. **interface** *interface-id*
18. **spanning-tree portfast** {**disable** | **trunk**}
19. **service instance** *number* **ethernet** [*name*]
20. **encapsulation** {**default** | **dot1q** | **priority-tagged** | **untagged**}
21. **bridge-domain** *bridge-id* [**split-horizon group** *group-id*]
22. **cfm mep domain** *domain-name* **mpid** *mpid*
23. **link-protection group** *group-number*
24. **exit**
25. **show ethernet cfm maintenance-points remote detail**

DETAILED STEPS

	Command or Action	**Purpose**
Step 1	**enable** **Example:** Router> **enable**	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** Router# **configure terminal**	Enter global configuration mode.
Step 3	**ethernet cfm global** **Example:** Router(config)# **ethernet cfm global**	Enables Ethernet CFM globally.
Step 4	**link-protection enable** **Example:** Router(config)# **link-protection enable**	Enables link protection globally on the router.

	Command or Action	**Purpose**
Step 5	**link-protection group management vlan** *vlan-id* **Example:** Router(config)# **link-protection group management vlan 51**	Defines the management VLAN used for link protection.
Step 6	**link-protection suspend-interval interval** *interval* **Example:** Router(config)# **link-protection suspend-interval 320**	Sets a link protection suspend interval.
Step 7	**link-protection group** *group-number* **pccm vlan** *vlan-id* **Example:** Router(config)# **link-protection group 2 pccm vlan 16**	Specifies an ODU-to-ODU continuity check message (P-CCM) VLAN.
Step 8	**ethernet cfm domain** *domain-name* **level** *level-id* [**direction outward**] **Example:** Router(config)# **ethernet cfm domain eccm1 level 0**	Configures the CFM domain for ODU 1 and enters Ethernet CFM configuration mode.
Step 9	**id null** **Example:** Router(config-ecfm)# **id null**	Configures a maintenance domain identifier (MDID).
Step 10	**service** {*ma-name* | *ma-num* | *vlan-id vlan-id* | *vpn-id vpn-id*} [**port** | **vlan** *vlan-id* [**direction down**]] **Example:** Router(config-ecfm)# **service 1 vlan 14 direction down**	Defines a maintenance association for ODU 1 and enters Ethernet CFM service instance configuration mode.
Step 11	**mep mpid** *mpid* **Example:** Router(config-ecfm-srv)# **mep mpid 1**	Defines the remote MEP ID.
Step 12	**continuity-check** [**interval** *time* | **loss-threshold** *threshold* | **static rmep**] **Example:** Router(config-ecfm-srv)# **continuity-check interval 100ms**	Enables transmission of continuity check messages (CCMs) within the ODU 1 maintenance association and defines a continuity-check interval.

	Command or Action	Purpose
Step 13	**exit** **Example:** Router(config-ecfm-srv)# exit	Exits Ethernet CFM service instance configuration mode.
Step 14	**exit** **Example:** Router(config-ecfm)# exit	Exits Ethernet CFM configuration mode.
Step 15	**ethernet cfm domain** *domain-name* **level** *level-id* [**direction outward**] **Example:** Router(config)# ethernet cfm domain eccm2 level 0	Configures the CFM domain for ODU 2 and enters CFM configuration mode.
Step 16	**id null** **Example:** Router(config-ecfm)# id null	Configures a maintenance domain identifier (MDID).
Step 17	**interface** *interface-id* **Example:** Router(config)# **interface gigabitethernet0/0/1**	Enter interface configuration mode. Valid interfaces are physical ports.
Step 18	**spanning-tree portfast** {**disable** | **trunk**} **Example:** Router(config-if)# spanning-tree portfast trunk	Enables PortFast on the interface when it is in trunk mode.
Step 19	**service instance** *number* **ethernet** [*name*] **Example:** Router(config-if)# **service instance 1 Ethernet**	Configure an EFP (service instance) and enter service instance configuration) mode. • The number is the EFP identifier, an integer from 1 to 4000. • (Optional) **ethernet** name is the name of a previously configured EVC. You do not need to use an EVC name in a service instance.
Step 20	**encapsulation** {**default** | **dot1q** | **priority-tagged** | **untagged**} **Example:** Router(config-if-srv)# **encapsulation dot1q 10**	Configure encapsulation type for the service instance. • **default**—Configure to match all unmatched packets. • **dot1q**—Configure 802.1Q encapsulation. See Table 1 for details about options for this keyword. • **priority-tagged**—Specify priority-tagged frames, VLAN-ID 0 and CoS value of 0 to 7.

	Command or Action	Purpose
		• **untagged**—Map to untagged VLANs. Only one EFP per port can have untagged encapsulation.
Step 21	**bridge-domain** *bridge-id* [**split-horizon group** *group-id*] **Example:** Router(config-if-srv)# **bridge-domain 3000**	Configure the bridge domain ID. The range is from 1 to 4000. You can use the **split-horizon** keyword to configure the port as a member of a split horizon group. The *group-id* range is from 0 to 2.
Step 22	**cfm mep domain** *domain-name* **mpid** *mpid* **Example:** Router(config-if)# **cfm mep domain eccm1 mpid 1**	Configures a CFM MEP domain for ODU 1.
Step 23	**link-protection group** *group-number* **Example:** Router(config-if)# **link-protection group 1**	Configures a link-protection group for ODU 2.
Step 24	**exit** **Example:** Router(config-if)# **exit**	Exits interface configuration mode.
Step 25	**show ethernet cfm maintenance-points remote detail** **Example:** Router# **show ethernet cfm maintenance-points remote detail**	(Optional) Displays remote maintenance endpoints in the continuity check database.

Configuring NSN Microwave 1+1 HSBY Protocol and CFM CCM Extensions

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **ethernet cfm global**
4. **link-protection enable**
5. **link-protection group management vlan** *vlan-id*
6. link-protection group *group-number* pccm **vlan** *vlan-id*
7. **ethernet cfm domain** *domain-name* **level** *level-id* [**direction outward**]
8. **id** {*mac-address domain-number* | **dns** *dns-name* | **null**}
9. **service** {*ma-name* | *ma-num* | **vlan-id** *vlan-id* | **vpn-id** *vpn-id*} [**port** | **vlan** *vlan-id* [**direction down**]]
10. **continuity-check** [**interval** *time* | **loss-threshold** *threshold* | **static rmep**]
11. **exit**

12. **exit**
13. **ethernet cfm domain** *domain-name* **level** *level-id* [**direction outward**]
14. **id** {*mac-address domain-number* | **dns** *dns-name* | **null**}
15. **service** {*ma-name* | *ma-num* | **vlan-id** *vlan-id* | **vpn-id** *vpn-id*} [**port** | **vlan** *vlan-id* [**direction down**]]
16. **continuity-check** [**interval** *time* | **loss-threshold** *threshold* | **static rmep**]
17. **exit**
18. **exit**
19. **interface** *type slot* **/** *port*
20. **spanning-tree portfast** {**disable** | **trunk**}
21. **cfm mep domain** *domain-name* **mpid** *mpid* {**port** | **vlan** *vlan-id*}
22. link-protection group *group-number*
23. **exit**
24. **interface** *type slot* **/** *port*
25. **spanning-tree portfast** {**disable** | **trunk**}
26. **cfm mep domain** *domain-name* **mpid** *mpid* {**port** | **vlan** *vlan-id*}
27. link-protection group *group-number*
28. **end**
29. **service instance trunk** *id* **ethernet**
30. **encapsulation dot1q** *vlan-id* [**,** *vlan-id* [**-** *vlan-d*]]
31. **rewrite ingress tag pop 1 symmetric**
32. **bridge-domain from-encapsulation**
33. **show ethernet cfm maintenance-points remote detail**

DETAILED STEPS

	Command or Action	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	**ethernet cfm global** **Example:** Router(config)# ethernet cfm global	Enables Ethernet CFM globally.
Step 4	**link-protection enable** **Example:** Router(config)# link-protection enable	Enables link protection globally on the router.

	Command or Action	**Purpose**
Step 5	**link-protection group management vlan** *vlan-id* **Example:** Router(config)# link-protection group management vlan 51	Defines the management VLAN used for link protection.
Step 6	link-protection group *group-number* pccm **vlan** *vlan-id* **Example:** Router(config)# link-protection group 2 pccm vlan 16	Specifies an ODU-to-ODU continuity check message (P-CCM) VLAN.
Step 7	**ethernet cfm domain** *domain-name* **level** *level-id* [**direction outward**] **Example:** Router(config)# ethernet cfm domain eccm1 level 0	Configures the CFM domain for ODU 1 and enters Ethernet CFM configuration mode.
Step 8	**id** {*mac-address domain-number*	**dns** *dns-name*	**null**} **Example:** Router(config-ecfm)# id null	Configures a maintenance domain identifier (MDID).
Step 9	**service** {*ma-name*	*ma-num*	**vlan-id** *vlan-id*	**vpn-id** *vpn-id*} [**port**	**vlan** *vlan-id* [**direction down**]] **Example:** Router(config-ecfm)# service 1 vlan 14 direction down	Defines a maintenance association for ODU 1 and enters Ethernet CFM service instance configuration mode.
Step 10	**continuity-check** [**interval** *time*	**loss-threshold** *threshold*	**static rmep**] **Example:** Router(config-ecfm-srv)# continuity-check interval 100ms	Enables transmission of continuity check messages (CCMs) within the ODU 1 maintenance association and defines a continuity-check interval.
Step 11	**exit** **Example:** Router(config-ecfm-srv)# exit	Exits Ethernet CFM service instance configuration mode.
Step 12	**exit** **Example:** Router(config-ecfm)# exit	Exits Ethernet CFM configuration mode.

		Command or Action	Purpose
Step 13		**ethernet cfm domain** *domain-name* **level** *level-id* [**direction outward**] **Example:** `Router(config)# ethernet cfm domain eccm2 level 0`	Configures the CFM domain for ODU 2 and enters CFM configuration mode.
Step 14		**id** {*mac-address domain-number*	**dns** *dns-name*	**null**} **Example:** `Router(config-ecfm)# id null`	Configures a maintenance domain identifier (MDID).
Step 15		**service** {*ma-name*	*ma-num*	**vlan-id** *vlan-id*	**vpn-id** *vpn-id*} [**port**	**vlan** *vlan-id* [**direction down**]] **Example:** `Router(config-ecfm)# service 2 vlan 15 direction down`	Defines a maintenance association for ODU 2 and enters Ethernet CFM service configuration mode.
Step 16		**continuity-check** [**interval** *time*	**loss-threshold** *threshold*	**static rmep**] **Example:** `Router(config-ecfm-srv)# continuity-check interval 100ms`	Enables transmission of CCMs within the ODU 2 maintenance association and defines a continuity-check interval.
Step 17		**exit** **Example:** `Router(config-ecfm-srv)# exit`	Exits Ethernet CFM service instance configuration mode.
Step 18		**exit** **Example:** `Router(config-ecfm)# exit`	Exits Ethernet CFM configuration mode.
Step 19		**interface** *type* *slot* **/** *port* **Example:** `Router(config)# interface gigabitethernet 1/1`	Configures the interface to be connected to ODU 1 and enters interface configuration mode.
Step 20		**spanning-tree portfast** {**disable**	**trunk**} **Example:** `Router(config-if)# spanning-tree portfast trunk`	Enables PortFast on the interface when it is in trunk mode.
Step 21		**cfm mep domain** *domain-name* **mpid** *mpid* {**port**	**vlan** *vlan-id*}	Configures a CFM MEP domain for ODU 1.

	Command or Action	Purpose

	Example:
	
	`Router(config-if)# ethernet cfm mep domain eccm1`
	`mpid 1 vlan 14`	

Step 22	link-protection group *group-number* **Example:** `Router(config-if)# link-protection group 1`	Configures a link-protection group for ODU 2.
Step 23	**exit** **Example:** `Router(config-if)# exit`	Exits interface configuration mode.
Step 24	**interface** *type slot / port* **Example:** `Router(config)# interface GigabitEthernet 3/2`	Configures the interface to be connected to ODU 2 and enters interface configuration mode.
Step 25	**spanning-tree portfast** {**disable**	**trunk**} **Example:** `Router(config-if)# spanning-tree portfast trunk`	Enables PortFast on the interface when it is in trunk mode.

Step 26	**cfm mep domain** *domain-name* **mpid** *mpid* {**port**	**vlan** *vlan-id*}
		Example:
		
		`Router(config-if)# ethernet cfm mep domain eccm2`
		`mpid 1 vlan 15`
			Configures a CFM MEP domain for ODU 2.

Step 27	link-protection group *group-number* **Example:** `Router(config-if)# link-protection group 1`	Configures a link-protection group for ODU 2.
Step 28	**end** **Example:** `Router(config-if)# end`	Returns the CLI to privileged EXEC mode.

Step 29	**service instance trunk** *id* **ethernet**
	Example:
	
	`Router(config-if)# service instance trunk 1`
	`ethernet`
		Configures an Ethernet service instance on an interface and enters Ethernet service configuration mode.

	Command or Action	Purpose
Step 30	**encapsulation dot1q** *vlan-id* [**,** *vlan-id* [**-** *vlan-d*]] **Example:** `Device(config-if-srv)# encapsulation dot1q 1-5, 7, 9-12`	Defines the matching criteria to map 802.1Q frames ingress on an interface to the appropriate service instance.
Step 31	**rewrite ingress tag pop 1 symmetric** **Example:** `Device(config-if-srv)# rewrite ingress tag pop 1 symmetric`	Specifies the encapsulation adjustment to be performed on a frame that is entering a service instance.
Step 32	**bridge-domain from-encapsulation** **Example:** `Device(config-if-srv)# bridge-domain from-encapsulation`	Creates a list of bridge domains for an EFP trunk port using the bridge-domain IDs derived from the encapsulation VLAN numbers.
Step 33	**show ethernet cfm maintenance-points remote detail** **Example:** `Router# show ethernet cfm maintenance-points remote detail`	(Optional) Displays remote maintenance endpoints in the continuity check database.

Configuration Examples

This section contains configuration examples for HSBY protocol.

CFM Domain and MEP Configuration

This example is a sample CFM domain and MEP configuration that follows the NSN requirements for monitoring ODUs. The **link-protection** command for configuring NSN-specific parameters is included. CFM configuration parameters for an IDU are shown within angle brackets (<>):

```
link-protection suspend-interval <80s, 160s, 240s, 320s>
link-protection management vlan <51-4094>
link-protection pccm vlan <16-50>
!
ethernet cfm ieee
ethernet cfm global
!
ethernet cfm domain <Domain for ODU1> level 0
 id null
 service number <number> vlan <1-15> direction down
 continuity-check
 continuity-check interval <10, 100, 1000ms>
!
ethernet cfm domain <Domain for ODU2> level 0
 id null
```

```
 service number <number> vlan <1-15> direction down
  continuity-check
  continuity-check interval <10, 100, 1000ms>
!
interface GigabitEthernet 0/3
 ethernet cfm mep domain <Domain for ODU1> mpid 1 vlan <1-15>
   link-protection group <group #>
!
interface GigabitEthernet 0/4
 ethernet cfm mep domain <Domain for ODU2> mpid 1 vlan <1-15>
   link-protection group <group #>
!
```

HSBY Sample Configuration

The following configuration example shows how to configure HSBY. This example uses EVC interfaces, which are the only supported interfaces for HSBY on the Cisco ASR 903 Series Router.

```
!
link-protection enable
link-protection suspend-interval 320
link-protection group 1
link-protection management-vlan 500
!
ethernet cfm ieee
ethernet cfm global
!
ethernet cfm domain ECCM1 level 0
 id null
 service number 1 evc EVCODU1 vlan 10 direction down
  continuity-check
  continuity-check interval 10ms
!
ethernet cfm domain ECCM2 level 0
 id null
 service number 1 evc EVCODU2 vlan 11 direction down
  continuity-check
  continuity-check interval 10ms
!
!
interface GigabitEthernet0/0/1
spanning-tree portfast trunk
service instance 1 ethernet EVCODU1
description ODU1-ECCM-EVC
encapsulation dot1q 10
bridge-domain 10
 cfm mep domain ECCM1 mpid 100 vlan 10
   link-protection group 1
!
service instance 2 ethernet
description ODU1-Management-Vlan
encapsulation dot1q 500
bridge-domain 500
!
service instance trunk 3 ethernet
description ODU1-Data-Vlan
encapsulation dot1q 100-200
bridge-domain from-encapsulation
!
!
interface GigabitEthernet0/0/2
spanning-tree portfast trunk
```

```
service instance 2 ethernet EVCODU2
description ODU2-ECCM-EVC
encapsulation dot1q 10
bridge-domain 10
 cfm mep domain ECCM2 mpid 100 vlan 11
  link-protection group 1
!
service instance 2 ethernet
description ODU1-Management-Vlan
encapsulation dot1q 500
bridge-domain 500
!
service instance trunk 3 ethernet
description ODU1-Data-Vlan
encapsulation dot1q 100-200
rewrite ingress tag pop 1 symmetric
bridge-domain from-encapsulation
```