



## Configuring Hot Standby MAC Address

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The Hot Standby MAC Address (HSMA) feature achieves redundancy and fault tolerance and avoids a single point of failure of Cisco Channel Interface Processors (CIPs) or Channel Port Adapters (CPAs). This feature also ensures that multiple devices on the Ethernet can have a common MAC address.

This chapter contains the following sections:

- [Prerequisites for Hot Standby MAC Address, page 642](#)
- [Restrictions for Hot Standby MAC Address, page 642](#)
- [Information About Hot Standby MAC Address, page 642](#)
- [How to Configure Hot Standby MAC Address Functionality, page 643](#)
- [Configuration Examples for Hot Standby MAC Address, page 649](#)

## Prerequisites for Hot Standby MAC Address

- Two Cisco CIPs or CPAs must be configured.
- The CIPs or CPAs must have a minimum of 32 MB memory or more available.
- Cisco Mainframe Channel Connection (CMCC) Ucode release 28-14 or later must be used.

## Restrictions for Hot Standby MAC Address

HSMA is used for IBM mainframe application only.

## Information About Hot Standby MAC Address

To configure the Hot Standby MAC Address feature on a CIP or CPA, you should understand the following concepts:

- [Multiple CIPs or CPAs in the Ethernet Environment, page 642](#)
- [Behavior of HSMA Protocol Between Two HSMA Peers, page 642](#)
- [Active Service Access Points on the Adapter, page 643](#)
- [Benefits of Hot Standby MAC Address, page 643](#)

## Multiple CIPs or CPAs in the Ethernet Environment

When you migrate from Token Ring and/or FDDI to Ethernet, you lose the ability to have multiple CIPs and CPAs in the network with duplicate MAC addresses. Under Token Ring and FDDI, the physical medium format provides a means of distinguishing among the common multiple MAC addresses by way of the routing information field (RIF). Ethernet does not provide this RIF in its definition. When you use duplicate MAC addresses in an Ethernet environment, confusion occurs in the switch tables, resulting in link loss.

## Behavior of HSMA Protocol Between Two HSMA Peers

An HSMA environment consists of two control adapters working together as peers. The adapters can be either two CIPs, two CPAs, or one CIP and one CPA. A Cisco CIP or a CPA in an HSMA environment must have a peer to be effective. Peered devices communicate with each other over a Logical Link Control (LLC) session between the two control adapters. Each peer monitors the other and negotiates roles in the event of a race condition. The LLC stack is enhanced to allow HSMA also to control the virtual adapters. When a device negotiates to be a standby device, it disables the virtual adapter on the CIP or CPA. When disabled, the virtual adapter does not transmit any MAC frame with the HSMA MAC adapter's source address. Only the active device utilizes the HSMA MAC adapter address owing to the restriction that Ethernet switches enforce. If both devices advertise the address at the same time, unpredictable results ensue.

A new HSMA protocol facilitates communication between two HSMA peers. The HSMA protocol data is carried over the LLC session between the peers. The exchange of information between the two peers decides which state (active state or inactive state) the two devices are in. When there is a loss of communication, the devices assume that their partner has been taken offline either by a network error or because of a network outage, and the local peer goes into the active state.

## Active Service Access Points on the Adapter

HSMA monitors the state of the local Extended Communications Adapter (XCA) device by checking for active service access points (SAPs) periodically. When there are open SAPs on the adapter, the adapter is considered to be in an XCA active state; otherwise the adapter is considered to be in an XCA inactive state. Therefore, you should never configure an adapter that is used by the HSMA stack to be used by any other feature on the CIP or CPA; such a configuration might cause HSMA to see a false positive. By monitoring the XCA device, host operators force a device change by forcing all the XCA devices on that adapter to become inactive.

## Benefits of Hot Standby MAC Address

- Hot Standby MAC Address allows two virtual MAC addresses to be used on a channel with only one of them in an active state at a time.
- The MAC addresses exchange messages. If one of them stops receiving the other's messages, it starts itself as the active MAC address.
- Two adapters can be set up together to share the same MAC address.
- In an Ethernet environment, one of the adapters will be active at any given time and will process the packets while the other adapter remains in the disabled state.

## How to Configure Hot Standby MAC Address Functionality

This section contains the following procedures:

- [Configuring the Active Adapter, page 643](#) (required)
- [Configuring the HSMA Control Adapter, page 644](#) (required)
- [Tuning HSMA, page 646](#) (optional)

## Configuring the Active Adapter

Use this task to configure the active HSMA adapter.

### SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface channel *slot/port***
4. **csna path device**

5. **lan** *type lan-id*
6. **source-bridge** *source-ring-number bridge-number target-ring-number*
7. **adapter** *adapter-number mac-address hsma-partner hsma-mac-address*

## DETAILED STEPS

	Command or Action	Purpose
Step 1	<b>enable</b>  <b>Example:</b> Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> <li>Enter your password if prompted.</li> </ul>
Step 2	<b>configure terminal</b>  <b>Example:</b> Router# configure terminal	Enters global configuration mode.
Step 3	<b>interface channel slot/port</b>  <b>Example:</b> Router(config)# interface channel 1/0	Enters channel interface configuration mode.
Step 4	<b>csna path device</b>  <b>Example:</b> Router(config-if)# csna 0190 09	Configures SNA support on the CMCC channel interface. <ul style="list-style-type: none"> <li>This command specifies the path and device on a physical channel of the router to communicate with an attached mainframe.</li> </ul>
Step 5	<b>lan type lan-id</b>  <b>Example:</b> Router(config-if)# lan tokenring 20	Configures an internal Token Ring LAN on the CMCC adapter interface and enters internal LAN configuration mode.
Step 6	<b>source-bridge source-ring-number bridge-number target-ring-number</b>  <b>Example:</b> Router(cfg-lan-Token 20)# source-bridge 310 3 100	Configures the interface for source route bridging (SRB).
Step 7	<b>adapter adapter-number mac-address hsma-partner hsma-mac-address</b>  <b>Example:</b> Router(cfg-lan-Token 20)# adapter 20 4062.1515.6014 hsma-partner 4062.5555.0015	Configures the active HSMA adapter. <ul style="list-style-type: none"> <li>The <b>hsma-partner</b> keyword is used to specify the shared HSMA MAC address.</li> </ul>

## Configuring the HSMA Control Adapter

Use this task to configure the HSMA control adapter.

## SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface channel** *slot/port*
4. **lan** *type lan-id*
5. **source-bridge** *source-ring-number bridge-number target-ring-number*
6. **adapter** *adapter-number mac-address*
7. **hsma enable**

## DETAILED STEPS

	Command or Action	Purpose
Step 1	<b>enable</b>  <b>Example:</b> Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"><li>Enter your password if prompted.</li></ul>
Step 2	<b>configure terminal</b>  <b>Example:</b> Router# configure terminal	Enters global configuration mode.
Step 3	<b>interface channel slot/port</b>  <b>Example:</b> Router(config)# interface channel 1/0	Enters channel interface configuration mode.
Step 4	<b>lan type lan-id</b>  <b>Example:</b> Router(config-if)# lan tokenring 26	Configures an internal Token Ring LAN on the CMCC adapter interface and enters internal LAN configuration mode.
Step 5	<b>source-bridge source-ring-number bridge-number target-ring-number</b>  <b>Example:</b> Router(cfg-lan-Token 20)# source-bridge 319 9 100	Configures the interface for SRB.
Step 6	<b>adapter adapter-number mac-address</b>  <b>Example:</b> Router(cfg-lan-Token 20)# adapter 26 4043.1111.001a	Configures the HSMA control adapter.
Step 7	<b>hsma enable</b>  <b>Example:</b> Router(cfg-lan-Token 20-26)# exit	Enables HSMA.

## Tuning HSMA

Use this task to fine-tune the HSMA configuration.

## SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface channel** *slot/port*
4. **lan** *type lan-id*
5. **adapter** *adapter-number mac-address* [**hsma-partner** *hsma-mac-address*]
6. **hsma dead-interval** *time-interval*
7. **hsma hello-interval** *hello-interval*
8. **hsma preferred**
9. **hsma shutdown**
10. **hsma control-sap** *sap-address*
11. **exit**
12. **shutdown**
13. **no shutdown**

## DETAILED STEPS

	Command or Action	Purpose
Step 1	<b>enable</b>  <b>Example:</b> Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"><li>Enter your password if prompted.</li></ul>
Step 2	<b>configure terminal</b>  <b>Example:</b> Router# configure terminal	Enters global configuration mode.
Step 3	<b>interface channel slot/port</b>  <b>Example:</b> Router(config)# interface channel 1/0	Enters channel interface configuration mode.
Step 4	<b>lan type lan-id</b>  <b>Example:</b> Router(config-if)# lan tokenring 26	Configures an internal Token Ring LAN on the CMCC adapter interface and enters internal LAN configuration mode.
Step 5	<b>adapter adapter-number mac-address [hsma-partner hsma-mac-address]</b>  <b>Example:</b> Router(cfg-lan-Token 20)# adapter 26 4043.1111.001a	Configures either the active HSMA controller or the HSMA control adapter.
Step 6	<b>hsma dead-interval time-interval</b>  <b>Example:</b> Router(cfg-lan-Token 20-26)# hsma dead-interval 8	(Optional) Configures the time interval during which at least one hello packet must be received from the peer HSMA adapter or else the router declares that neighbor down.
Step 7	<b>hsma hello-interval hello-interval</b>  <b>Example:</b> Router(cfg-lan-Token 20-26)# hsma hello-interval 2	(Optional) Configures the time interval between hello messages that pass between the HSMA CIP or CPAs
Step 8	<b>hsma preferred</b>  <b>Example:</b> Router(cfg-lan-Token 20-26)# hsma preferred	(Optional) Assigns priority to a peer as the control adapter.
Step 9	<b>hsma shutdown</b>  <b>Example:</b> Router(cfg-lan-Token 20-26)# hsma shutdown	(Optional) Stops HSMA on an adapter and hence enables the partner adapter.
Step 10	<b>hsma control-sap sap-address</b>  <b>Example:</b> Router(cfg-lan-Token 20-26)# hsma control-sap e8	(Optional) Overrides the default control SAP for HSMA peer communications. <ul style="list-style-type: none"><li>Changing the control SAP requires that the CMCC be restarted.</li></ul>

	Command or Action	Purpose
Step 11	<code>exit</code>  <b>Example:</b> <code>Router(config-if)# exit</code>	Returns to channel interface configuration mode.
Step 12	<code>shutdown</code>  <b>Example:</b> <code>Router(config-if)# shutdown</code>	Shuts down the channel interface, prior to restarting it with the <b>no shutdown</b> command. <ul style="list-style-type: none"> <li>Restarting the CMCC is only necessary for the <b>hsma control-sap</b> command to take effect.</li> </ul>
Step 13	<code>no shutdown</code>  <b>Example:</b> <code>Router(config-if)# no shutdown</code>	Restarts the channel interface. <ul style="list-style-type: none"> <li>Restarting the CMCC is only necessary for the <b>hsma control-sap</b> command to take effect.</li> </ul>

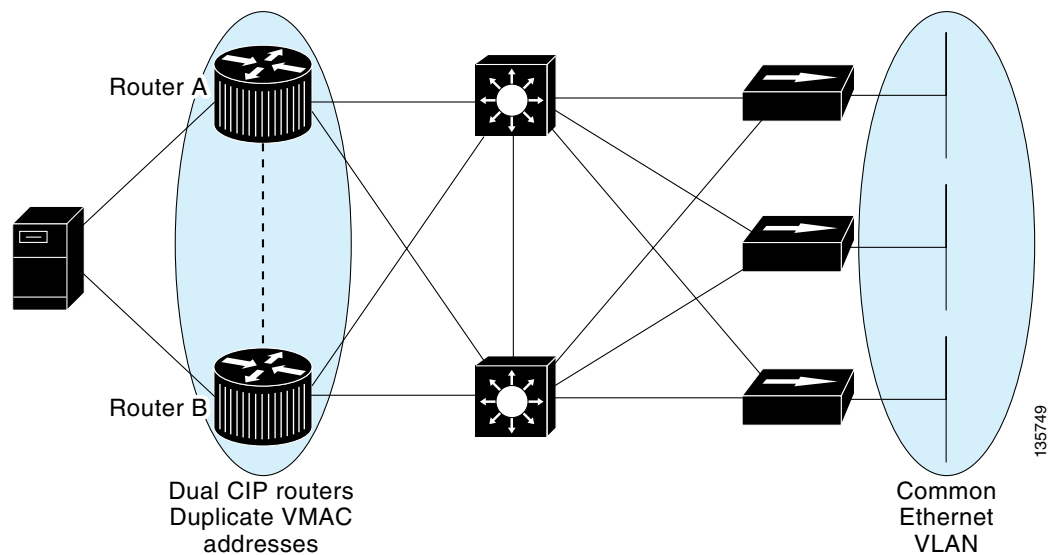
## Configuration Examples for Hot Standby MAC Address

This section provides the following configuration examples:

- [HSMA on Router A: Example, page 650](#)
- [HSMA on Router B: Example, page 650](#)

Figure 248 shows the HSMA network topology.

Figure 248 HSMA Network Topology



## HSMA on Router A: Example

The following example configures HSMA on Router A to work with the HSMA configuration on Router B. To see the corresponding configuration on Router B, see the section [“HSMA on Router B: Example.”](#)

```
source-bridge ring-group 100
source-bridge transparent 100 1 1 1
!
interface GigabitEthernet 1/0/0
    bridge-group 1
!
interface Channel 2/0
    csna 0150 00
!
interface Channel11/0
    csna 0190 09
    lan TokenRing 20
    source-bridge 310 3 100
! This is the active adapter.
    adapter 9 4043.1313.9009 hsma-partner 4043.3333.001a
    lan TokenRing 26
    source-bridge 319 9 100
    adapter 26 4043.1111.001a
! This is the HSMA control adapter.
    hsma enable
!
bridge 1 protocol ieee
```

## HSMA on Router B: Example

The following example configures HSMA on Router B to work with the HSMA configuration on Router A. To see the corresponding configuration on Router A, see the section [“HSMA on Router A: Example.”](#)

```
source-bridge ring-group 100
source-bridge transparent 100 1 1 1
!
interface GigabitEthernet 1/0/0
    bridge-group 1
!
interface Channel 2/0
    csna 0150 00
!
interface Channel13/0
    lan TokenRing 23
    source-bridge 330 3 100
    adapter 9 4043.1313.9009 hsma-partner 4043.1111.001a
    lan TokenRing 31
    source-bridge 339 9 100
    adapter 26 4043.3333.001a
    hsma enable
!
bridge 1 protocol ieee
```