Maintaining and Administering the Route Switch Feature Card

This chapter describes how to perform maintenance and administrative tasks on the Catalyst 5000 family Route Switch Feature Card (RSFC). The RSFC is a router module that runs Cisco IOS software, The module is based on the Cisco Route/Switch Processor 2 (RSP2) and provides inter-VLAN routing support for the Catalyst 5000 family switches.

Note For complete information on installing the Catalyst 5000 family RSFC, refer to the *Catalyst 5000 Family Supervisor Engine Installation Guide*.

Note For information on configuring interVLAN routing on the RSFC, see Chapter 3, "Configuring InterVLAN Routing."

Note For complete syntax and usage information for the IOS commands used in this chapter, refer to the Cisco IOS Software Configuration Guides and Command References. For complete syntax and usage information for the switch commands used in this chapter, refer to the *Command Reference* for your switch.

This chapter consists of these sections:

RSFC Functional Description

These sections provide a functional overview of the Catalyst 5000 family RSFC:

Functional Overview

The RSFC is a router feature card for the Catalyst 5000 family Supervisor Engine II G and Supervisor Engine III G modules. The RSFC runs Cisco IOS router software and directly interfaces to the Catalyst switch backplane to provide interVLAN routing.

VLAN Interfaces

The RSFC contains no physical interfaces. InterVLAN routing is accomplished using virtual interfaces that correspond one-to-one with the VLANs configured on the switch. For example, if you configure VLAN 100 on the switch, you can configure an RSFC interface in that VLAN by creating interface vlan100. All interface configuration on the RSFC is performed on these VLAN interfaces.

Note The RSFC supports interVLAN routing for up to 256 VLANs.

MAC Addresses

VLAN interfaces on the RSFC are assigned the base MAC address from a MAC address serial EEPROM on the RSFC that contains 64 MAC addresses. All user-configurable routing interfaces use the base MAC address by default. If desired, you can override the default MAC address assignment for an interface. For more information, see the "Assigning a Nondefault MAC Address to an Interface" section on page 10-10. Normally, there is no need to override the default MAC address.

System Memory Description

The RSFC system memory configuration is as follows:

- Boot ROM—The ROM monitor image is stored in an EPROM located on the RSFC.
- Flash memory—Flash memory allows you to store multiple Cisco IOS system software images and configuration files on the RSFC. You can boot the RSFC from the images and configuration files stored in Flash memory. The Flash memory on the RSFC consists of a single Flash device, **bootflash:**, a Flash SIMM located on the feature card.
- NVRAM—The system configuration information and software configuration register settings are stored in nonvolatile RAM (NVRAM).
- DRAM—DRAM stores routing tables, protocols, and network accounting applications. The standard RSFC configuration is 64-MB DRAM, with support for up to 128-MB DRAM available through SIMM upgrades.

System Software Description

The RSFC uses these system software images:

- ROM monitor—This software image runs from ROM at power up, in the event of a reload request, or after a nonrecoverable event (such as a bus error). This image can access files on the **bootflash:** device but does not have any network interface code.
- Boot helper image—This software image is a limited function system image that has network interface code and end-host protocol code. This image is used as a backup in case a problem occurs when the RSFC is programming Flash for the system image. This image is run from RAM.
- System image—This software image is the main Cisco IOS software image with full multiprotocol routing support.

Note For information on how the RSFC uses these software images at startup, see the "RSFC Boot Process" section on page 10-4.

Configuration Register Boot Field

The lowest four bits of the 16-bit configuration register (bits 3, 2, 1, and 0) form the boot field. The value of the boot field determines if the RSFC loads a system image and where the RSFC searches for the image:

- When the boot field is set to 0000 (0x0), the RSFC does not load a system image. Instead, the RSFC enters the ROM monitor, where you can manually specify a system image to load.
- When the boot field is set to 0001 (0x1), the RSFC attempts to load the first system image found on the **bootflash:** device.
- When the boot field is set to any value between 0010 (0x2) and 1111 (0xF) inclusive, the RSFC attempts to load the first system image specified in the BOOT environment variable. (For more information on the BOOT variable, see the "BOOT Environment Variable" section on page 10-4.)

For information on changing the configuration register boot field value, see the "Setting the Configuration Register Boot Field" section on page 10-7. For more information on the RSFC boot process, see the "RSFC Boot Process" section on page 10-4.

BOOTLDR Environment Variable

The BOOTLDR environment variable specifies one or more RSFC boot helper images. When the BOOTLDR variable is defined, the RSFC boots the specified boot helper image, which in turn boots a system image from Flash or over the network. If an entry in the BOOTLDR environment variable list specifies an invalid device or file, the RSFC skips that entry.

For information on changing the BOOTLDR environment variable, see the "Setting the BOOTLDR Variable" section on page 10-8. For more information on the RSFC boot process, see the "RSFC Boot Process" section on page 10-4.

BOOT Environment Variable

The BOOT environment variable specifies one or more RSFC system images on various devices (such as **bootflash:** and **tftp:**). If the configuration register boot field value is set to any value between 0x2 and 0xF inclusive, the RSFC checks the contents of the BOOT variable at startup to determine the location and filename of the image to boot.

If an entry in the BOOT environment variable list does not specify a device, the RSFC assumes the device is **tftp**:. If an entry in the BOOT environment variable list specifies an invalid device, the RSFC skips that entry.

For information on changing the BOOT environment variable, see the "Setting the BOOT Variable" section on page 10-9. For more information on the RSFC boot process, see the "RSFC Boot Process" section on page 10-4.

RSFC Boot Process

When you boot a Catalyst 5000 family switch with an RSFC installed, the following process occurs on the RSFC:

1. The ROM monitor image loads and checks the value of the configuration register boot field.

   If the boot field equals 0x0, the boot process ends and the system remains in ROM monitor mode.

   If the boot field equals 0x1, the ROM monitor proceeds to Step 2.

   If the boot field equals any value between 0x2 and 0xF inclusive, the ROM monitor proceeds to Step 3.

2. The ROM monitor checks the contents of the BOOTLDR variable.

   If one or more boot helper images are specified in the BOOTLDR variable, the ROM monitor attempts to locate and load the images in the specified order. The ROM monitor loads into RAM the first boot helper image that is successfully located and is a valid RSFC boot helper image file and then proceeds to Step 4.

   If the BOOTLDR variable is empty (no boot helper image is specified), if none of the specified boot helper images can be located, or if none of the specified images are valid RSFC boot helper images, the ROM monitor proceeds to Step 6.

3. The ROM monitor checks the contents of the BOOT variable.

   If one or more system images are specified in the BOOT variable, the system attempts to locate and load the images in the specified order. The system boots the first image that is successfully located and is a valid RSFC system image file, and the boot process ends.

   If the BOOT variable is empty (no system image is specified), if none of the specified system images can be located, or if none of the specified images are valid RSFC system images, the system proceeds to Step 5.

4. The boot helper image checks the contents of the BOOT variable.

   If one or more system images are specified in the BOOT variable, the boot helper attempts to locate and load the images in the specified order. The boot helper boots the first image that is successfully located and is a valid RSFC system image file, and the boot process ends.

   If the BOOT variable is empty (no system image is specified), if none of the specified system images can be located, or if none of the specified images are valid RSFC system images, the system proceeds to Step 6.

5 The ROM monitor attempts to load the first image in **bootflash:**.

If there is a valid RSFC system image in **bootflash:**, the ROM monitor boots that system image and the boot process ends.

If there is not a valid RSFC system image in **bootflash:**, the boot process ends and the system remains in ROM monitor mode.

6 The boot helper attempts to load the first image in **bootflash:**.

If there is a valid RSFC system image in **bootflash:**, the boot helper boots that system image and the boot process ends.

If there is not a valid RSFC system image in **bootflash:**, the boot process ends and the system remains in boot helper mode.

RSFC Redundancy

Up to two Catalyst 5000 family supervisor engines with RSFCs can be installed in the Catalyst 5500 series chassis. Redundant RSFCs do not exchange configuration or system image information. Configuration changes on one RSFC do not affect the configuration of the second RSFC. You must manually configure both RSFCs independently.

Both RSFCs in a redundant configuration are active (even though one of the supervisor engines is in standby mode) and can perform routing functions. You can use the Hot Standby Router Protocol (HSRP) on VLAN interfaces to provide router interface backup.

In the event that the active supervisor engine fails, the system switches over to the standby supervisor engine. In this case, the redundant RSFC takes over all routing functions of the first RSFC (provided HSRP is configured properly on both RSFCs).

Note For information on configuring HSRP, see Chapter 3, "Configuring InterVLAN Routing."

Hardware and Software Requirements

The RSFC requires these software and hardware versions:

- Catalyst 5000 family Supervisor Engine II G or Supervisor Engine III G
- Supervisor engine software release 5.1 or later
- Cisco IOS software release 12.0(3c)W5(8a) or later on the RSFC

Maintaining and Administering the RSFC

These sections describe common maintenance and administrative tasks you need to perform on the RSFC:

Setting the RSFC Module and Port Name from the Switch CLI

To set the name of the RSFC module and port from the switch CLI, perform this task in privileged mode:

Task		Command
Step 1	Set the RSFC module name.	**set module name** *mod_num name_string*
Step 2	Set the RSFC port name.	**set port name** *mod_num/port_num name_string*
Step 3	Verify the configuration.	**show module** [*mod_num*]
		show port [*mod_num*[**/***port_num*]]

This example shows how to set the port name of the RSFC in slot 1 and verify the configuration:

```
Console> (enable) set module name 15 RSFC module
Module name set.
Console> (enable) set port name 15/1 RSFC Port
Port 15/1 name set.
Console> (enable) show module 15
Mod Slot Ports Module-Type               Model               Status
--- ---- ----- ------------------------- ------------------- --------
15  1    1     Route Switch Feature Card WS-F5541            ok

Mod Module-Name         Serial-Num
--- ------------------- --------------------
15  RSFC module         00000001234

Mod MAC-Address(es)                         Hw     Fw          Sw
--- --------------------------------------- ------ ----------- -----------------
16  00-e0-aa-bb-cc-dd to 00-e0-aa-bb-cd-1c 0.1    12.0(3a)W5 12.0(3a)W5(8)
Console> (enable) show port 15/1
Port  Name               Status     Vlan       Level  Duplex Speed Type
----- ------------------ ---------- ---------- ------ ------ ----- ------------
15/1  RSFC Port          connected  1          normal   half   400 Route Switch

Port   Trap      IfIndex
-----  --------  -------
15/1   disabled  653


Use 'session' command to see router counters.

Last-Time-Cleared
--------------------------
Wed Mar 31 1999, 15:50:26
Console> (enable)
```

Downloading a System Image to the RSFC Flash

To download an RSFC system image, perform this task in privileged EXEC mode:

Task	Command
Download an RSFC system image.	**copy** *source-url destination-url*

This example shows how to download an RSFC system image from a **tftp:** device (TFTP server) to the **bootflash:** device:

```
Router#copy tftp: bootflash:
Address or name of remote host []? 172.20.52.3
Source filename []? c5rsfc-js-mz.120-3.W5.8.bin
Destination filename [c5rsfc-js-mz.120-3.W5.8.bin]?
Accessing tftp://172.20.52.3/c5rsfc-js-mz.120-3.W5.8.bin...
Loading c5rsfc-js-mz.120-3.W5.8.bin .from 172.20.52.3 (via FastEthernet2/0.1): !
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
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!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
[OK - 3862105/7724032 bytes]

3862105 bytes copied in 259.224 secs (14911 bytes/sec)
Router#
```

Downloading a System Image to the RSFC from the Switch CLI

In the event that you cannot session to the RSFC or the boot Flash is corrupted, you can download a new system image from the switch CLI directly to the RSFC RAM using TFTP.

Note When you download a system image to the RSFC from the switch CLI, the image is stored in RAM only. To permanently store the system image on the RSFC, you must **session** to the RSFC and use the **copy** command to copy the system image file from the TFTP server to the Flash file system, as described in the "Downloading a System Image to the RSFC Flash" section on page 10-6.

To download a new system image to the RSFC using TFTP, perform this task in privileged mode:

Task	Command
Download a system image to the RSFC using TFTP from the switch CLI.	**download** *host_ip_addr filename mod_num*

Resetting the RSFC from the Switch CLI

To reset the RSFC from the switch CLI, perform this task in privileged mode:

Task	Command
Reset the RSFC.	**reset** *mod_num*

Setting the Configuration Register Boot Field

The configuration register boot field determines whether or not the RSFC loads a system image, and if so, where it should search for the system image. For more information on the function of the configuration register boot field, see the "Configuration Register Boot Field" section on page 10-3.

To set the configuration register boot field value on the RSFC, perform this task in global configuration mode:

Task		Command
Step 1	Obtain the current configuration register setting.	**show bootvar**
Step 2	Enter configuration mode.	**configure terminal**
Step 3	Modify the existing configuration register value. Change the least significant hexadecimal digit to a value between 0x0 and 0xF to reflect how you want the RSFC to load a system image.	**config-register** *value*
Step 4	Exit configuration mode.	**Ctrl-Z**
Step 5	Save the running configuration to NVRAM.	**copy running-config startup-config**
Step 6	Reboot the RSFC to make your changes take effect.	**reload**

This example shows how to change the configuration register boot field value to 0x2 (to cause the RSFC to boot the system image specified by the BOOT variable), given the current configuration register value of 0x101:

```
Router#show bootvar
BOOT variable =
CONFIG_FILE variable does not exist
BOOTLDR variable does not exist
Configuration register is 0x101

Router#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#config-register 0x102
Router(config)#^Z
Router#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...

Router#reload
```

Setting the BOOTLDR Variable

The RSFC uses the BOOTLDR variable to locate a boot helper image to boot. For more information on the function of the BOOTLDR variable, see the "BOOTLDR Environment Variable" section on page 10-3.

To set the BOOTLDR environment variable on the RSFC, perform this task in global configuration mode:

Task		Command
Step 1	(Optional) Check the current contents of the BOOTLDR variable, if desired.	**show bootvar**
Step 2	Enter configuration mode.	**configure terminal**
Step 3	Specify the *file_url:* of the boot helper image. The *file_url:* contains the Flash device name and the filename of the system image file.	**boot bootldr** *file_url:*
Step 4	Exit configuration mode.	**Ctrl-Z**
Step 5	Save the running configuration to NVRAM.	**copy running-config startup-config**

Task		Command
Step 6	Reboot the RSFC to make your changes take effect.	**reload**

This example shows how to add an image file in **bootflash:** to the BOOT variable:

```
Router#show bootvar
BOOT variable =
CONFIG_FILE variable does not exist
BOOTLDR variable does not exist
Configuration register is 0x102

Router#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#boot bootldr bootflash:c5rsfc-boot-mz.120-3c.W5.8.bin
Router(config)#^Z
Router#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...

Router#reload
```

Setting the BOOT Variable

The RSFC uses the BOOT variable to locate a system image to boot. For more information on the function of the BOOT variable, see the "BOOT Environment Variable" section on page 10-4.

To set the BOOT environment variable on the RSFC, perform this task in global configuration mode:

Task		Command
Step 1	(Optional) Check the current contents of the BOOT variable, if desired.	**show bootvar**
Step 2	Enter configuration mode.	**configure terminal**
Step 3	Specify the *file_url:* of the system image. The *file_url:* contains the Flash device name and the filename of the system image file.	**boot system flash** *file_url:*
Step 4	Exit configuration mode.	**Ctrl-Z**
Step 5	Save the running configuration to NVRAM.	**copy running-config startup-config**
Step 1	(Optional) Verify the change to the BOOT variable, if desired.	**show bootvar**
Step 2	Reboot the RSFC to make your changes take effect.	**reload**

This example shows how to add an image file in **bootflash:** to the BOOT variable:

```
Router#show bootvar
BOOT variable =
CONFIG_FILE variable does not exist
BOOTLDR variable does not exist
Configuration register is 0x102

Router#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#boot system flash bootflash:c5rsfc-js-mz.120-3c.W5.8.bin
Router(config)#^Z
Router#copy running-config startup-config
```

```
Destination filename [startup-config]?
Building configuration...

Router#reload
```

Assigning a Nondefault MAC Address to an Interface

To assign a nondefault MAC address to an RSFC VLAN interface, perform this task in interface configuration mode:

Task		Command
Step 1	Assign a non-default MAC address to the VLAN interface.	**mac-address** *H.H.H*
Step 2	Verify the configuration.	**show interface vlan** *vlan-id*

This example shows how to assign a nondefault MAC address to an RSFC VLAN interface and verify the configuration:

```
Router#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#interface vlan 200
Router(config-if)#mac-address 1234.5678.9ABC
Router(config-if)#^Z
Router#show interface vlan 200
Vlan200 is up, line protocol is up
  Hardware is Cat5k Virtual Ethernet, address is 1234.5678.9abc (bia 0010.0d3e.)

<...output truncated...>

Router#
```