ISSU and eFSU on Cisco 7600 Series Routers

This chapter provides information about how to perform a software upgrade on a Cisco 7600 series router using the In Service Software Upgrade feature.

This chapter contains the following sections:

ISSU and eFSU Overview

In most networks, software upgrades require system downtime. With the In Service Software Upgrade (ISSU) feature, however, you can upgrade the router software while the router continues to forward traffic. Thus, ISSU increases network availability and reduces the downtime caused by software upgrades.

The Cisco 7600 series router supports the following types of upgrade procedures. The same ISSU commands and upgrade procedure are used for both types of upgrades.

- ISSU—Provides software upgrades with minimal system downtime. This feature is available for software upgrades between Cisco IOS software releases that have the same line card software. (Available in Cisco IOS Release 12.2SRB1 and later releases.)
- enhanced Fast Software Upgrade (eFSU)—A subset of ISSU, eFSU helps to minimize outage time during a software upgrade by preloading new line card software images onto supported line cards. This feature is available for upgrades between releases that have different line card software. (Available in Cisco IOS Release 12.2SRB and later releases.)

ISSU uses the existing features of NonStop Forwarding (NSF) with Stateful SwitchOver (SSO) to perform the software upgrade. In a redundant system with two supervisor engines or route switch processors (RSPs), one of the processors is active while the other operates in standby mode, ready to take over processing if the active processor goes down.

During an in service software upgrade (ISSU or eFSU), new software is loaded onto the standby processor while the active processor continues to operate using the old software. As part of the upgrade, a switchover occurs between the active and standby processors, and the standby processor becomes active and begins running the new software. You can continue with the upgrade to load the new software onto the other processor, or you can abort the upgrade and resume operation with the old software.

If the new software release contains new line card software and the line cards in the router support eFSU, the upgrade process preloads the new line card software onto the line cards. When the switchover occurs (between the active and standby processors), the line cards are restarted with the new software image. By preloading the new software image onto the line cards, eFSU helps to minimize outage time during the software upgrade.

For detailed information about ISSU, see the *Cisco IOS In Service Software Upgrade Process* document at:

http://www.cisco.com/univercd/cc/td/doc/product/software/ios122sr/newft/122srb33/sbisefsu.htm

ISSU Overview

Cisco IOS Releases 12.2SRB1 and later support ISSU on Cisco 7600 series routers. During an ISSU upgrade, the router continues to route and forward traffic, which allows you to upgrade from one software release to another with minimal system downtime (between 0 and 3 seconds).

ISSU is available for NSF/SSO compliant protocols and software features on the router. See the "ISSU Support" section on page 6-5 for a list of Cisco 7600 protocols and features that support ISSU.

Note To perform an ISSU upgrade, the old and new Cisco IOS software releases must have the same line card software. If the releases have different line card software, the router performs an eFSU upgrade.

eFSU Overview

eFSU helps to minimize outage time during an in service software upgrade by preloading a new software image onto line cards that support the feature. During the software upgrade process, a switchover occurs between the active and standby supervisor engines or RSPs. When the switchover occurs, the line cards are restarted. Line cards that support eFSU are restarted with the new, preloaded software image.

The following Cisco 7600 line cards support eFSU:

- SIP-400 and SIP-600
- ESM-2x10GE and ESM-20x1GE-3C
- 67*xx* line cards

All other Cisco 7600 line cards undergo a hard reset at switchover, and the software image is loaded after the line card is restarted.

Note To support eFSU, a line card must have 512 MB of memory, with enough memory available to hold the new software image. If enough memory is not available, the software preload fails and the line card undergoes a reset during the switchover.

Outage Time and Support Considerations

During an eFSU upgrade, line cards are restarted or reset after the switchover that occurs between processors. Because the line cards are restarted or reset, any links attached to the line cards flap and traffic processing is disrupted until protocols and software features are brought back online. The length of time that line card processing is disrupted (outage time) depends on whether the eFSU process was able to preload a new software image onto the line card.

- For line cards that support eFSU, the outage time is similar to that in RPR+ mode.
- For line cards that do not support eFSU, the outage time is similar to that in RPR mode.

Once the new software is downloaded (**issu loadversion**), you can use the **show issu outage slot all** command to display the maximum outage time for installed line cards. See the "Displaying Maximum Outage Time for Installed Line Cards (Optional)" section on page 6-14 for a command example.

If you attempt to load an earlier version of software onto the router and the new (earlier) version does not support a currently installed line card, one of two things happens:

- If you use the **force** option in the **issu loadversion** command, the router is placed in RPR mode.
- If you omit the **force** option, the eFSU process is aborted and error messages are displayed to indicate that there is a problem with the line card.

Reserving Line Card Memory

On line cards that support eFSU, the router automatically reserves memory on the line card to store the new software image (decompressed format). The amount of memory needed varies according to line card type.

Although we do not recommend it, you can issue the following command to keep the router from reserving memory for the software preload (where *slot-num* specifies which slot the line card is installed in):

```
no mdr download reserve memory image slot slot-num
```

Note If a line card does not have enough memory available to hold the new software image, software preload fails and the card undergoes a reset during the switchover. Outage time is similar to that with RPR (because the new line card image must be loaded after the line card is restarted).

To determine how much memory will be reserved on the line card, use the **show mdr download image** command, as shown in the following example (for a Cisco 7600 SIP-600):

```
SIP-600# show mdr download image
Pre-download information
Slot CPU In-Progress Complete LC Mem Resv (bytes)
 1   0     N          N        0
 1   1     N          N        0
 2   0     N          N        0
 2   1     N          N        0
 3   0     N          N        0
 3   1     N          N        0
 4   0     N          N        0
 4   1     N          N        0
 5   0     N          N        0
 5   1     N          N        0
 6   0     N          Y        36175872
 6   1     N          N        0
 7   0     N          N        0
 7   1     N          N        0
```

```
 8   0     N          N        0
 8   1     N          N        0
 9   0     N          Y        35127296
 9   1     N          N        0
10   0     N          Y        31195136
10   1     N          N        0
11   0     N          N        0
11   1     N          N        0
12   0     N          N        0
12   1     N          N        0
13   0     N          Y        31195136
13   1     N          N        0

SIP-600#
```

eFSU Operation

During a software upgrade, the router performs the following steps on line cards that support eFSU. These steps occur automatically during the upgrade process, and no user intervention is required.

- Reserves the necessary memory for the new Cisco IOS software image on each installed line card (if the line card supports software preload).
- Preloads a new software image onto supported line cards as part of the **issu loadversion** command.
- Restarts line cards with the new software image when switchover occurs (**issu runversion**).
- If a rollback or abort occurs, the router restores the line card software to its original version. To provide as little disruption as possible, the router preloads the original software version back onto the line card. Once the rollback or abort is completed, the line card is restarted with the original software version.

Error Handling for Line Card Software Preload

If problems occur during line card software preload, the router takes the following actions:

- Line card crash during load version—The line card is reset when switchover occurs.
- Line card not active when eFSU started—No power is provided to the line card during the software upgrade, and the line card is reset when the process ends. The same action is applied to a line card that is inserted into the router after the software upgrade process has begun.
- Line card crash during run version or during rollback—The line card boots with the software image version that corresponds to the software image that is present on the active supervisor engine or RSP.

Cisco 7600 ISSU and eFSU Support

During an ISSU upgrade, NSF/SSO compliant protocols and software features continue to operate and minimal system downtime occurs. Routing protocols and software features that are not NSF/SSO compliant are restarted during the upgrade, which means that they stop operating for awhile after the restart until they are brought back online.

To perform an ISSU upgrade, the old and new Cisco IOS software releases must have the same line card software. If the releases have different line card software, the router performs an eFSU upgrade.

ISSU Support

ISSU is supported on the following Cisco 7600 hardware and software:

Availability

- Cisco IOS Release 12.2SRB1 and later

Hardware

- All supported Cisco 7600 chassis (including enhanced [-S] chassis)
- RSP720-3C, RSP720-3CXL, Sup720-3B, Sup720-3BXL, Sup32
- All Cisco 7600 line cards, DFCs, and other modules

Software

- 802.1q
- 802.1x
- ARP
- ATM
- BGP
- Etherchannel (PagP and LACP)
- GLBP
- HDLC
- HSRP
- IPv4
- L2 multicast
- MLP (Multilink PPP)
- MPLS (including LDP, TE, and VPN)—See the *ISSU MPLS Client* document for information about the steps you should perform during the upgrade. http://www.cisco.com/en/US/docs/ios/mpls/configuration/guide/mp_issu_clients_ps6922_TSD_Products_Configuration_Guide_Chapter.html#wp1054109
- NetFlow
- PPP
- QoS
- RIB (routing information base)
- SNMP
- SPAN and Remote SPAN
- STP
- VRF (Virtual Routing and Forwarding)

ISSU Compatibility Matrix for Cisco IOS Software Releases

The following table lists the compatibility matrix for ISSU between various Cisco IOS releases for C7600. If the ISSU is supported between two releases the column is marked as yes and if ISSU is not supported between two releases the corresponding column is marked as no.

Table 6-1 ISSU Compatibility Matrix

Cisco IOS Release	12.2 (33) SRB	12.2 (33) SRC	12.2 (33) SRD	12.2 (33) SRE	15.0 (1) S and later releases
12.2 (33) SRB	Yes	Yes	No	No	No
12.2 (33) SRC	Yes	Yes	No	No	No
12.2 (33) SRD	No	No	Yes	Yes	No
12.2 (33) SRE	No	No	Yes	Yes	No
15.0(1) S and later releases	No	No	No	No	Yes

eFSU Support

eFSU is supported on the following Cisco 7600 hardware and software:

Availability

- Cisco IOS Release 12.2SRB and later
- RSP720 and Sup32 support introduced in Release 12.2(33)SRB1

Hardware

- All Cisco 7600 chassis (except the 3-slot chassis, CISCO7603)
- RSP720-3C, RSP720-3CXL, Sup720-3B, Sup720-3BXL, Sup32
- DFC3B, DFC3BXL, DFC3C, DFC3CXL
- ESM-2x10GE, ESM-20x1GE-3C
- SIP-400, SIP-600, 67*xx* line cards

Unsupported Hardware

- Enhanced FlexWAN, OSM-GE-WAN
- 68*xx*, 65*xx*, 64*xx*, 63*xx*, and 61*xx* line cards

Software Support

During an eFSU, Cisco 7600 line cards are restarted, and software features and routing protocols are not available during the restart. Outage time depends on whether the line cards support eFSU (see the "eFSU Overview" section on page 6-2).

Cisco 7600 ISSU and eFSU Guidelines and Limitations

Following is a list of guidelines and limitations for performing an in service software upgrade on Cisco 7600 series routers. Unless otherwise noted, the guidelines apply to both ISSU and eFSU.

- Unsupported Cisco 7600 hardware and software can co-exist with ISSU or eFSU (that is, both can be present in the router). In addition, the router gracefully restarts any unsupported protocols to prevent "black hole" situations.
- To perform an in service software upgrade, a router requires two route processors (RPs): an active RP and a standby RP. On the Cisco 7600 router, two supervisor engines or route switch processors (RSPs) are required because they contain the route processors for the router.
- Both the active and standby supervisor engines or RSPs must have at least 256 MB of flash memory in which to store both the old and new software images prior to the upgrade process.
- The same ISSU commands and upgrade procedure are used for both ISSU and eFSU. The only difference is that during an ISSU upgrade, the line cards are not restarted as they are during an eFSU.
- The router examines the old and new software images and automatically performs the appropriate process (ISSU or eFSU) to upgrade the software image:
  - If the line card software is the same in both the old and new software images, the router performs an ISSU to upgrade the software. System downtime is from 0 to 3 seconds.
  - If the line card software in both images is different, line cards are restarted or reset during the upgrade process. System downtime depends on whether the line cards support eFSU (see the "Outage Time and Support Considerations" section on page 6-3 for more information).
- The ISSU upgrade feature is supported for all software features that support NSF/SSO. Software features that do not support NSF/SSO stop operating for awhile, until they are brought back online after the switchover that occurs during the software upgrade.
- All line cards that support eFSU must have at least 512 MB of memory for software preload to succeed. Otherwise, the preload fails for those line cards.
- Line cards that support eFSU must have enough memory available to hold the new software image. If enough memory is not available, the software preload fails and the cards undergo a reset during the switchover (that occurs between the active and standby supervisor engines or RSPs).
- ISSU and eFSU are supported only in SSO mode. They are not supported in RPR and RPR+ mode.
- Online insertion and replacement (OIR) is not supported during an in service software upgrade. If you attempt to insert a new line card in the router while the upgrade is active, the router does not provide power for the card. When the upgrade ends, the router resets the newly inserted line card.
- Do not perform a manual switchover between supervisor engines or RSPs during the upgrade. Although the router allows it, we strongly discourage this.
- ISSU commands (which are also used for eFSU) are available in the command-line interface (CLI) only if a supported processor is installed in the router. The commands are not available if another type of supervisor engine or RSP is installed.
  - In Release 12.2SRB1 or later, the commands are available with the RSP720, Sup720, or Sup32.
  - In Release 12.2SRB, the commands are available only if a Sup720 is installed.
- Make sure that the configuration register is set to allow autoboot (the lowest byte of the register should be set to 2).
- Before you issue the **issu abortversion** command (to abort a software upgrade), make sure that the standby supervisor engine or RSP is Up (STANDBY HOT [in SSO] or COLD [in RPR]).

- Use the Fast Software Upgrade (FSU) process to upgrade from an earlier software version to Cisco IOS Release 12.2SRB or later. During this process, the line card software image is also upgraded on those line cards that support eFSU.
- On modules that do not support eFSU, you can upgrade software images in Route Processor Redundancy (RPR) mode.
- ISSU fails if the Active and Standby supervisors are booted with the same image from different file systems.

Performing an In Service Software Upgrade

The following sections describe the process for performing an in service software upgrade (ISSU or eFSU) on the Cisco 7600 router. The following steps are discussed:

Each section briefly describes a particular step in the upgrade process and provides command examples. In the command examples, important fields in the command output are shown in boldface. Check these fields to verify the status of the command.

For detailed information about any of the commands, see the *Cisco IOS In Service Software Upgrade Process* document (feature guide) on the 12.2SRB new feature documentation site at the following URL:

http://www.cisco.com/univercd/cc/td/doc/product/software/ios122sr/newft/122srb33/sbisefsu.htm

Software Upgrade Process Summary

Here is a summary of the tasks required to upgrade (or downgrade) a software image on the Cisco 7600 router. The following sections provide examples of the software upgrade process on the router.

The same set of ISSU commands and upgrade procedure are used for both ISSU and eFSU.

Note The ISSU upgrade process is available only for Cisco IOS releases that share the same line card software. If the line card software in the releases is different, the router performs an eFSU upgrade.

	Command or Action	Purpose
Step 1	`Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	`Router# copy tftp disk_name`	Uses TFTP to copy the new software image to flash memory on the active and standby RPs (disk0: and slavedisk0:). Answer the prompts to identify the name and location of the new software image.
Step 3	`Router# configure terminal`	Enters global configuration mode.
Step 4	`Router(config)# no service image-version efsu` `Router(config)# end`	Disables the compatibility matrix check, which is necessary to perform a software upgrade on the Cisco 7600 router. The **end** command returns you to privileged EXEC mode.

Step 5	`Router# show version | in image`
	`Router# show bootvar`
	
	`Router# show redundancy`
	`Router# show issu state [detail]`
		These **show** commands verify that the router is ready to run ISSU or eFSU. The **show version** and **show bootvar** commands verify the boot image settings.
		The **show redundancy** and **show issu state** commands verify that redundancy mode is enabled and that SSO and NSF are configured.
		Note Use **show redundancy** and **show issu state** throughout the upgrade (as shown in the following examples) to verify the status of the upgrade.

Step 6	`Router# issu loadversion active-slot active-image standby-slot standby-image [force]`	Starts the upgrade process and loads the new software image onto the standby RP. It may take several seconds for the new image to load and for the standby RP to transition to SSO mode.
Step 7	`Router# remote command switch show issu outage slot all`	(Optional) Displays the maximum outage time for installed line cards. Issue the command on the switch processor (SP) of the supervisor engine or RSP. **Note** The command **show issu outage slot all** is supported on SP only.
Step 8	`Router# issu runversion slot image`	Forces a switchover, causing the standby supervisor engine or RSP to become active and begin running the new software. The previously active processor becomes standby and boots with the old image.
Step 9	`Router# issu acceptversion {active slot-number | active slot-name slot-name}`	(Optional) Halts the rollback timer to ensure that the new software image is not automatically aborted during the upgrade process.
Step 10	`Router# issu commitversion slot active-image`	Loads the new software image onto the standby supervisor engine or RSP in the specified slot.
Step 11	`Router# show redundancy` `Router# show issu state [detail]`	Verifies the status of the upgrade process. If the upgrade was successful, both the active and standby supervisor engines or RSPs are running the new software version.

Preparing for the Upgrade

Before attempting to perform a software upgrade, be sure to review the "Cisco 7600 ISSU and eFSU Guidelines and Limitations" section on page 6-7.

To prepare for ISSU or eFSU, perform the tasks in the following sections:

- Disabling the Compatibility Matrix Check, page 6-10
- Verifying the Boot Image Version and Boot Variable, page 6-10
- Verifying Redundancy Mode, page 6-10
- Verifying ISSU State, page 6-11

Disabling the Compatibility Matrix Check

To perform a software upgrade on the Cisco 7600 router, you must first disable the compatibility matrix check by issuing the following command in global configuration mode:

```
Router(config)# no service image-version efsu
```

Verifying the Boot Image Version and Boot Variable

Before starting, it is a good idea to issue the **show version** and **show bootvar** commands to verify the boot image version and BOOT environment variable for the router, as shown in the following examples:

```
Router# show version | in image
System image file is "disk0:oct22"

Router# show bootvar
BOOT variable = disk0:oct22,1;
CONFIG_FILE variable =
BOOTLDR variable =
Configuration register is 0x2102

Standby BOOT variable = disk0:oct22,1;
Standby CONFIG_FILE variable =
Standby BOOTLDR variable =
Standby Configuration register is 0x2102
```

Verifying Redundancy Mode

It is also a good idea to verify that redundancy mode is enabled and that NSF and SSO are configured. The following command example shows how to verify redundancy:

```
Router# show redundancy

Redundant System Information :
------------------------------
       Available system uptime = 9 minutes
Switchovers system experienced = 0
              Standby failures = 0
        Last switchover reason = none

                 Hardware Mode = Duplex
    Configured Redundancy Mode = sso
     Operating Redundancy Mode = sso
              Maintenance Mode = Disabled
                Communications = Up
```

```
Current Processor Information :
-------------------------------
               Active Location = slot 5
        Current Software state = ACTIVE
       Uptime in current state = 8 minutes
                 Image Version = Cisco IOS Software, s72033_rp Software
(s72033_rp-ADVENTERPRISEK9_WAN_DBG-M), Version 12.2
Copyright (c) 1986-2006 by Cisco Systems, Inc.
Compiled Mon 23-Oct-06 02:43 by
                         BOOT = disk0:oct22,1;
                   CONFIG_FILE =
                       BOOTLDR =
        Configuration register = 0x2102

Peer Processor Information :
----------------------------
             Standby Location = slot 6
        Current Software state = STANDBY HOT
       Uptime in current state = 8 minutes
                 Image Version = Cisco IOS Software, s72033_rp Software
(s72033_rp-ADVENTERPRISEK9_WAN_DBG-M), Version 12.2
Copyright (c) 1986-2006 by Cisco Systems, Inc.
Compiled Mon 23-Oct-06 02:43 by
                         BOOT = disk0:oct22,1;
                   CONFIG_FILE =
                       BOOTLDR =
        Configuration register = 0x2102
```

Verifying ISSU State

You should also verify the ISSU state, as shown here:

```
Router# show issu state

                         Slot = 5
                    RP State = Active
                   ISSU State = Init
                Boot Variable = disk0:oct22,1;

                         Slot = 6
                    RP State = Standby
                   ISSU State = Init
                Boot Variable = disk0:oct22,1;
```

Copying the New Software Image

Before starting the ISSU or eFSU process, you must copy the new software image to flash memory (disk0: and slavedisk0:) on the active and standby route processors, which are located on the Cisco 7600 supervisor engine or route switch processor.

```
Router# copy tftp disk0:

Address or name of remote host []? sys1
Source filename []? /auto/tftpboot/image/c7600s72033-adventerprisek9_wan-mz
Destination filename [c7600s72033-adventerprisek9_wan-mz]? c7600s72033
Accessing tftp://sys1//auto/tftpboot/image/c7600s72033-adventerprisek9_wan-mz
Loading /auto/tftpboot/image/c7600s72033-adventerprisek9_wan-mz from 192.0.2.245 (via
GigabitEthernet5/1):
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
```

```
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
```
(command output omitted)

```
[OK - 124978660 bytes]

124978660 bytes copied in 259.868 secs (480931 bytes/sec)

Router# copy disk0:c7600s72033 slavedisk0:

Destination filename [c7600s72033]?
Copy in progress...CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
```
(command output omitted)

```
124978660 bytes copied in 308.488 secs (405133 bytes/sec)
```

Loading the New Software onto the Standby RP

Issue the **issu loadversion** command to start the upgrade process. This step reboots the standby supervisor engine or RSP and loads the new software image onto the standby's route processor. When the download is complete, you are prompted to issue the **runversion** command.

```
Router# issu loadversion 5 disk0:c7600s72033 6 slavedisk0:c7600s72033
Router#
*Oct 27 21:26:20.119: %OIR-SP-3-PWRCYCLE: Card in module 6, is being power-cycled (RF
request)
```

(The above line shows that the standby supervisor engine in slot 6 is rebooting. When the reboot is complete, the router loads the new image onto the standby.)

```
*Oct 27 21:26:20.775: %PFREDUN-SP-6-ACTIVE: Standby processor removed or reloaded,
changing to Simplex mode
*Oct 27 21:29:46.123: SP: pf_redun_check_img_compatibility: MATRIX result is compatible!!!
Of course...
*Oct 27 21:29:47.135: %PFREDUN-SP-6-ACTIVE: Standby initializing for SSO mode
*Oct 27 21:29:47.431: %SYS-SP-3-LOGGER_FLUSHED: System was paused for 00:00:00 to ensure
console debugging output.
*Oct 27 21:29:50.647: %PFINIT-SP-5-CONFIG_SYNC: Sync'ing the startup configuration to the
standby Router.
*Oct 27 21:30:29.687: %FABRIC-SP-5-CLEAR_BLOCK: Clear block option is off for the fabric
in slot 6.
*Oct 27 21:30:29.783: %FABRIC-SP-5-FABRIC_MODULE_BACKUP: The Switch Fabric Module in slot
6 became standby
*Oct 27 21:30:30.523: %DIAG-SP-6-RUN_MINIMUM: Module 6: Running Minimal Diagnostics...
*Oct 27 21:30:32.459: %DIAG-SP-6-DIAG_OK: Module 6: Passed Online Diagnostics
*Oct 27 21:30:32.675: %OIR-SP-6-INSCARD: Card inserted in slot 6, interfaces are now
online
*Oct 27 21:29:46.071: %SYS-SP-STDBY-3-LOGGER_FLUSHED: System was paused for 00:00:00 to
ensure console debugging output.
*Oct 27 21:30:14.123: %SPANTREE-SP-STDBY-5-EXTENDED_SYSID: Extended SysId enabled for type
vlan
*Oct 27 21:30:14.539: SP-STDBY: SP: Currently running ROMMON from S (Gold) region
*Oct 27 21:30:17.067: %DIAG-SP-STDBY-6-RUN_MINIMUM: Module 6: Running Minimal
Diagnostics...
*Oct 27 21:30:29.331: %DIAG-SP-STDBY-6-DIAG_OK: Module 6: Passed Online Diagnostics
*Oct 27 21:31:30.431: %SYS-SP-STDBY-5-RESTART: System restarted --
Cisco IOS Software (c7600s72033-ADVENTERPRISEK9_WAN_MZ), Version 12.2
Copyright (c) 1986-2006 by Cisco Systems, Inc.
Compiled Thu 26-Oct-06 03:49 by
```

```
*Oct 27 21:33:14.231: %ISSU_PROCESS-SP-7-DEBUG: Peer state is [ STANDBY HOT ]; Please
issue the runversion command
*Oct 27 21:33:13.471: %PFREDUN-SP-STDBY-6-STANDBY: Ready for SSO mode
*Oct 27 21:33:14.239: %RF-SP-5-RF_TERMINAL_STATE: Terminal state reached for (SSO)
*Oct 27 21:33:13.655: %SYS-SP-STDBY-3-LOGGER_FLUSHED: System was paused for 00:00:00 to
ensure console debugging output.
```

Note At this point, it is a good idea to check the status of the upgrade using the **show redundancy** and **show issu state detail** commands (see the following examples). When **issu loadversion** has finished, the standby RP should be loaded with the new software image and the RP should be in SSO mode. It might take several seconds for **issu loadversion** to complete; therefore, if you enter the **show** commands too soon you might not see the information you need.

```
Router# show redundancy

Redundant System Information :
------------------------------
       Available system uptime = 38 minutes
Switchovers system experienced = 0
              Standby failures = 1
        Last switchover reason = none

                 Hardware Mode = Duplex
    Configured Redundancy Mode = sso
     Operating Redundancy Mode = sso
               Maintenance Mode = Disabled
                 Communications = Up

Current Processor Information :
-------------------------------
               Active Location = slot 5
        Current Software state = ACTIVE
       Uptime in current state = 37 minutes
                 Image Version = Cisco IOS Software (c7600s72033-ADVENTERPRISEK9_WAN_MZ),
Version 12.2
Copyright (c) 1986-2006 by Cisco Systems, Inc.
Compiled Mon 23-Oct-06 02:43 by
                         BOOT = disk0:oct22,12
                   CONFIG_FILE =
                       BOOTLDR =
        Configuration register = 0x2102

Peer Processor Information :
----------------------------
              Standby Location = slot 6
        Current Software state = STANDBY HOT
       Uptime in current state = 13 minutes
                 Image Version = Cisco IOS Software (c7600s72033-ADVENTERPRISEK9_WAN_MZ),
Version 12.2
Copyright (c) 1986-2006 by Cisco Systems, Inc.
Compiled Thu 26-Oct-06 03:21 by
                         BOOT = disk0:c7600s72033,12;disk0:oct22,12
                   CONFIG_FILE =
                       BOOTLDR =
        Configuration register = 0x2102


Router# show issu state detail

                         Slot = 5
                    RP State = Active
```

```
          ISSU State = Load Version
        Boot Variable = disk0:oct22,12
       Operating Mode = sso
      Primary Version = disk0:oct22
    Secondary Version = disk0:c7600s72033
      Current Version = disk0:oct22
       Variable Store = PrstVbl
            ROMMON CV = [disk0:oct22]

                 Slot = 6
               RP State = Standby
          ISSU State = Load Version
        Boot Variable = disk0:c7600s72033,12;disk0:oct22,12
       Operating Mode = sso
      Primary Version = disk0:oct22
    Secondary Version = disk0:c7600s72033
      Current Version = disk0:c7600s72033
```

Displaying Maximum Outage Time for Installed Line Cards (Optional)

Once the new software is downloaded, you can issue the **show issu outage slot all** command on the switch processor (SP) to display the maximum outage time for installed line cards:

```
Router# remote command switch show issu outage slot all

Slot # Card Type                                MDR Mode          Max Outage Time
------ ---------------------------------------  -----------       ---------------
     1 CEF720 24 port 1000mb SFP                WARM_RELOAD        300 secs
     2 1-subslot SPA Interface Processor-600    WARM_RELOAD        300 secs
     3 4-subslot SPA Interface Processor-400    WARM_RELOAD        300 secs
     4 2+4 port GE-WAN                          RELOAD             360 secs

Router#
```

Note For an ISSU upgrade, the command output displays NSF_RELOAD for MDR Mode, which indicates that the line cards will not be restarted or reloaded and maximum outage time will be 0 to 3 seconds.

Forcing a Switchover from Active to Standby

Issue the **issu runversion** command to force a switchover between the active and standby supervisor engines or RSPs. The standby supervisor engine or RSP, which has the new software image loaded, becomes active. The previously active supervisor engine or RSP becomes the standby and boots with the old software image (in case the software upgrade needs to be aborted and the old image restored).

```
Router# issu runversion 6

This command will reload the Active unit.  Proceed ? [confirm]
*Oct 27 21:43:18.901: %SYS-SP-3-LOGGER_FLUSHING: System pausing to ensure console
debugging output.

*Oct 27 21:43:18.901: %OIR-SP-6-CONSOLE: Changing console ownership to switch processor
```

(Switchover between supervisors occurs now. The previous standby becomes active and is running the new software version [c7600s72033]. The previous active, now standby, boots with the old software [oct22].)

```
*Oct 27 21:43:19.105: %SYS-SP-3-LOGGER_FLUSHED: System was paused for 00:00:00 to ensure
console debugging output.

*Oct 27 21:43:21.702: %SYS-SP-3-LOGGER_FLUSHING: System pausing to ensure console
debugging output.

***
*** --- SHUTDOWN NOW ---
***

*Oct 27 21:43:21.702: %SYS-SP-5-RELOAD: Reload requested by Delayed Reload. Reload Reason:
Reason unspecified.
*Oct 27 21:43:21.702: %OIR-SP-6-CONSOLE: Changing console ownership to switch processor

*Oct 27 21:43:22.067: %SYS-SP-3-LOGGER_FLUSHED: System was paused for 00:00:00 to ensure
console debugging output.

System Bootstrap, Version 8.1(3)
Copyright (c) 1994-2004 by cisco Systems, Inc.
Cat6k-Sup720/SP processor with 1048576 Kbytes of main memory

Autoboot executing command: "boot disk0:oct22"
Loading image, please wait ...

Initializing ATA monitor library...
```

(command output omitted, new active log)

```
Press RETURN to get started!

*Oct 27 21:30:06.611: STDBY: RP: Currently running ROMMON from S (Gold) region
*Oct 27 21:31:07.923: %SPANTREE-STDBY-5-EXTENDED_SYSID: Extended SysId enabled for type
vlan
*Oct 27 21:31:30.183: %SYS-STDBY-5-RESTART: System restarted --
Cisco IOS Software (c7600s72033-ADVENTERPRISEK9_WAN_MZ), Version 12.2
Copyright (c) 1986-2006 by Cisco Systems, Inc.
Compiled Thu 26-Oct-06 03:21 by
*Oct 27 21:31:30.307: %SYS-STDBY-6-LOGGINGHOST_STARTSTOP: Logging to host 172.19.126.3
Port 514 started - CLI initiated
*Oct 27 21:43:22.067: %PFREDUN-SP-STDBY-6-ACTIVE: Initializing as ACTIVE processor
*Oct 27 21:43:22.071: %FABRIC-SP-STDBY-5-FABRIC_MODULE_ACTIVE: The Switch Fabric Module in
slot 6 became active.
*Oct 27 21:43:22.715: %SYS-SP-STDBY-3-LOGGER_FLUSHED: System was paused for 00:00:00 to
ensure console debugging output.
*Oct 27 21:43:24.363: %ISSU_PROCESS-SP-7-DEBUG: Initializing timers
*Oct 27 21:43:24.363: %ISSU_PROCESS-SP-7-DEBUG: rollback timer process has been started
*Oct 27 21:43:24.554: %C6KPWR-SP-4-PSOK: power supply 2 turned on.
*Oct 27 21:43:24.650: %OIR-SP-3-SOFT_RESET: Module 1 is being soft reset as a part of
swichover error recovery
*Oct 27 21:43:24.674: %LINK-SP-3-UPDOWN: Interface TenGigabitEthernet2/1, changed state to
down
*Oct 27 21:43:24.754: %OIR-SP-3-SOFT_RESET: Module 2 is being soft reset as a part of
swichover error recovery
*Oct 27 21:43:24.854: %OIR-SP-3-SOFT_RESET: Module 3 is being soft reset as a part of
swichover error recovery
*Oct 27 21:43:24.906: %OIR-SP-3-SOFT_RESET: Module 4 is being soft reset as a part of
swichover error recovery
*Oct 27 21:43:24.962: %OIR-SP-3-SOFT_RESET: Module 7 is being soft reset as a part of
swichover error recovery
```

(command output omitted)

```
*Oct 27 21:48:34.787: %SYS-SP-STDBY-6-BOOTTIME: Time taken to reboot after reload =  314
seconds
*Oct 27 21:50:31.059: %ISSU_PROCESS-SP-7-DEBUG: Peer state is [ STANDBY HOT ]; Please
issue the acceptversion command
*Oct 27 21:50:31.067: %PFREDUN-SP-STDBY-6-STANDBY: Ready for SSO mode
*Oct 27 21:50:31.067: %RF-SP-5-RF_TERMINAL_STATE: Terminal state reached for (SSO)
*Oct 27 21:50:31.251: %SYS-SP-STDBY-3-LOGGER_FLUSHED: System was paused for 00:00:00 to
ensure console debugging output.

Router# enable
```

Note At this point, the new active supervisor engine or RSP is running the new software image and the standby is running the old software image. You should verify the state of the active and standby supervisor engines or RSPs as shown in the following examples (**show redundancy** and **show issu state detail**).

```
Router# show redundancy

Redundant System Information :
------------------------------
       Available system uptime = 57 minutes
Switchovers system experienced = 1
              Standby failures = 0
        Last switchover reason = user initiated

                 Hardware Mode = Duplex
    Configured Redundancy Mode = sso
     Operating Redundancy Mode = sso
              Maintenance Mode = Disabled
                Communications = Up

Current Processor Information :
-------------------------------
               Active Location = slot 6
        Current Software state = ACTIVE
       Uptime in current state = 17 minutes
                 Image Version = Cisco IOS Software (c7600s72033-ADVENTERPRISEK9_WAN_MZ),
Version 12.2
Copyright (c) 1986-2006 by Cisco Systems, Inc.
Compiled Thu 26-Oct-06 03:21 by
                         BOOT = disk0:c7600s72033,12;disk0:oct22,12
                  CONFIG_FILE =
                      BOOTLDR =
        Configuration register = 0x2102

Peer Processor Information :
----------------------------
              Standby Location = slot 5
        Current Software state = STANDBY HOT
       Uptime in current state = 15 minutes
                 Image Version = Cisco IOS Software (c7600s72033-ADVENTERPRISEK9_WAN_MZ),
Version 12.2
Copyright (c) 1986-2006 by Cisco Systems, Inc.
Compiled Mon 23-Oct-06 02:43 by
                         BOOT = disk0:oct22,12
                  CONFIG_FILE =
                      BOOTLDR =
        Configuration register = 0x2102

router# show issu state detail

                         Slot = 6
                    RP State = Active
```

```
          ISSU State = Run Version
        Boot Variable = disk0:c7600s72033,12;disk0:oct22,12
       Operating Mode = sso
     Primary Version = disk0:c7600s72033
   Secondary Version = disk0:oct22
     Current Version = disk0:c7600s72033
      Variable Store = PrstVbl
           ROMMON CV = [disk0:c7600s72033]

               Slot = 5
          RP State = Standby
          ISSU State = Run Version
        Boot Variable = disk0:oct22,12
       Operating Mode = sso
     Primary Version = disk0:c7600s72033
   Secondary Version = disk0:oct22
     Current Version = disk0:oct22
```

Note To complete the upgrade process, issue the **issu acceptversion** (optional) and **issu commitversion** commands (as described in the following sections).

Accepting the New Software Version and Stopping the Rollback Process (Optional)

You must either accept or commit the new software image, or the rollback timer will expire and stop the upgrade process. If that occurs, the software image reverts to the previous software version. The rollback timer is a safeguard to ensure that the upgrade process does not leave the router nonoperational.

The following command sequence shows how **issu acceptversion** stops the rollback timer to enable you to examine the functionality of the new software image. When you are satisfied that the new image is acceptable, issue the **issu commitversion** command to end the upgrade process.

```
Router# show issu rollback-timer
        Rollback Process State = In progress
      Configured Rollback Time = 45:00
       Automatic Rollback Time = 27:08

Router# issu acceptversion 6
% Rollback timer stopped. Please issue the commitversion command.
```

Now view the rollback timer to see that the rollback process has been stopped:

```
Router# show issu rollback-timer
        Rollback Process State = Not in progress
      Configured Rollback Time = 45:00
```

Committing the New Software to the Standby

Issue the **issu commitversion** command to load the new software image onto the standby supervisor engine or RSP and complete the software upgrade process. In the following example, the new image (c7600s72033) is loaded onto the standby supervisor engine in slot 5:

```
Router# issu commitversion 5

Building configuration...
```

```
*Oct 27 22:09:57.239: %PFINIT-SP-5-CONFIG_SYNC: Sync'ing the startup configuration to the
standby Router. [OK]
feeder#
*Oct 27 22:10:15.613: %OIR-SP-3-PWRCYCLE: Card in module 5, is being power-cycled (RF
request)
```

(The standby supervisor engine in slot 5 begins rebooting. It then loads the new image.)

```
*Oct 27 22:10:15.639: %PFREDUN-SP-6-ACTIVE: Standby processor removed or reloaded,
changing to Simplex mode
*Oct 27 22:13:40.723: SP: pf_redun_check_img_compatibility: MATRIX result is compatible!!!
Of course...
*Oct 27 22:13:41.731: %PFREDUN-SP-6-ACTIVE: Standby initializing for SSO mode
*Oct 27 22:13:42.027: %SYS-SP-3-LOGGER_FLUSHED: System was paused for 00:00:00 to ensure
console debugging output.
*Oct 27 22:13:44.999: %PFINIT-SP-5-CONFIG_SYNC: Sync'ing the startup configuration to the
standby Router.
*Oct 27 22:14:24.019: %FABRIC-SP-5-CLEAR_BLOCK: Clear block option is off for the fabric
in slot 5.
*Oct 27 22:14:24.115: %FABRIC-SP-5-FABRIC_MODULE_BACKUP: The Switch Fabric Module in slot
5 became standby
```

(command output omitted)

```
*Oct 27 22:15:23.310: %SYS-SP-STDBY-5-RESTART: System restarted --
Cisco IOS Software (c7600s72033-ADVENTERPRISEK9_WAN_MZ), Version 12.2
Copyright (c) 1986-2006 by Cisco Systems, Inc.
Compiled Thu 26-Oct-06 03:49 by
*Oct 27 22:15:44.751: %PFREDUN-SP-STDBY-6-STANDBY: Ready for SSO mode
*Oct 27 22:15:45.135: %RF-SP-5-RF_TERMINAL_STATE: Terminal state reached for (SSO)
*Oct 27 22:15:44.935: %SYS-SP-STDBY-3-LOGGER_FLUSHED: System was paused for 00:00:00 to
ensure console debugging output.
```

Note The software upgrade process is now complete. Both the active and standby supervisor engines or RSPs are running the new software version.

Verifying the Software Installation

You should verify the status of the software upgrade. If the upgrade was successful, both the active and standby supervisor engines or RSPs are running the new software version.

```
Router# show redundancy

Redundant System Information :
------------------------------
       Available system uptime = 1 hour, 13 minutes
Switchovers system experienced = 1
              Standby failures = 1
        Last switchover reason = user initiated

                 Hardware Mode = Duplex
    Configured Redundancy Mode = sso
     Operating Redundancy Mode = sso
              Maintenance Mode = Disabled
                Communications = Up

Current Processor Information :
------------------------------
               Active Location = slot 6
```

```
        Current Software state = ACTIVE
       Uptime in current state = 33 minutes
                 Image Version = Cisco IOS Software (c7600s72033-ADVENTERPRISEK9_WAN_MZ),
Version 12.2
Copyright (c) 1986-2006 by Cisco Systems, Inc.
Compiled Thu 26-Oct-06 03:21 by
                         BOOT = disk0:c7600s72033,12;disk0:oct22,1;
                   CONFIG_FILE =
                       BOOTLDR =
        Configuration register = 0x2102

Peer Processor Information :
----------------------------
              Standby Location = slot 5
        Current Software state = STANDBY HOT
       Uptime in current state = 4 minutes
                 Image Version = Cisco IOS Software (c7600s72033-ADVENTERPRISEK9_WAN_MZ),
Version 12.2
Copyright (c) 1986-2006 by Cisco Systems, Inc.
Compiled Thu 26-Oct-06 03:21 by
                         BOOT = disk0:c7600s72033,12;disk0:oct22,1;
                   CONFIG_FILE =
                       BOOTLDR =
        Configuration register = 0x2102


router# show issu state detail

                         Slot = 6
                   RP State = Active
                  ISSU State = Init
                Boot Variable = disk0:c7600s72033,12;disk0:oct22,12
               Operating Mode = sso
             Primary Version = N/A
           Secondary Version = N/A
             Current Version = disk0:c7600s72033
              Variable Store = PrstVbl
                   ROMMON CV = [disk0:c7600s72033]

                         Slot = 5
                   RP State = Standby
                  ISSU State = Init
                Boot Variable = disk0:c7600s72033,12;disk0:oct22,12
               Operating Mode = sso
             Primary Version = N/A
           Secondary Version = N/A
             Current Version = disk0:c7600s72033
```

Aborting the Upgrade Process

You can manually abort the software upgrade at any stage by issuing the **issu abortversion** command. The upgrade process also aborts on its own if the software detects a failure.

If you abort the process after you issue the **issu loadversion** command, the standby supervisor engine or RSP is reset and reloaded with the original software.

The following is an example of the **issu abortversion** *slot image* command that shows how to abort the software upgrade process:

```
Router# issu abortversion 6 c7600s72033
```

Note Before you issue the **issu abortversion** command, make sure that the standby supervisor engine or RSP is Up (STANDBY HOT [in SSO] or COLD [in RPR]).

Upgrading a Non-eFSU Image to an eFSU Image

If the new Cisco IOS software image does not support eFSU, you must manually upgrade the software image. To do so, you must upgrade the software image on the standby supervisor engine or RSP and then perform a manual switchover so that the standby takes over processing with the new image. You can then upgrade the software image on the previously active, and now standby, supervisor engine or RSP. For instructions, see the "Performing a Fast Software Upgrade" section on page 7-8.

Command Reference

All of the standard ISSU commands are supported on Cisco 7600 series routers. For information about these commands, see the *Cisco IOS In Service Software Upgrade Process* document at:

http://www.cisco.com/univercd/cc/td/doc/product/software/ios122sr/newft/122srb33/sbisefsu.htm