



Installing and Upgrading Software

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Software Packaging on the Router

Software Package Modes

The router can be booted using any of the following:

- **Consolidated**—A single software image containing a full collection of software packages. This mode provides a simplified installation and can be stored in the bootflash, a TFTP server, or a network server.
- **Sub-package**—One or more sub-images that are extracted from the consolidated image. This mode provides optimized memory usage and requires that you store files in the bootflash directory.



Note The router supports both consolidated and sub-packages mode boot.

Understanding Software Packages

Table 1: Individual Sub-Packages

Sub-Package	Purpose
RPBase	Route Switch Processor (RSP) operating system
RPControl	Control plane processes between IOS process and the rest of the platform.
RPAccess	Handles security features including Secure Socket Layer (SSL) and Secure Shell (SSH)
RPIOS	Cisco IOS kernel, which is where IOS features are stored and run. Note Each consolidated image has a unique RPIOS package.
FP Pkg	Controls FP daemons.
IO Pkg	Controls input/output driver daemons.
LC Base	Controls basic kernel functions including runtime, initialization scripts, and chassis control daemons.

Provisioning Files

Provisioning files manage the boot process when the router is configured to boot in sub-packages. The provisioning file manages the bootup of each individual sub-package. Provisioning files are extracted automatically when individual sub-package files are extracted from a consolidated package. Provisioning files are not necessary for running the router using the complete consolidated package.

File Systems on the Router

Table 2: File Systems

File System	Description
bootflash:	The boot flash memory file system on the active RSP.
cns:	The Cisco Networking Services file directory.
nvrn:	Router NVRAM. You can copy the startup configuration to NVRAM or from NVRAM.
stby-bootflash:	The boot flash memory file system on the standby RSP.
stby-harddisk:	The hard disk file system on the standby RSP.
stby-usb0:	The Universal Serial Bus (USB) flash drive file systems on the standby RSP. Note stby-usb1: is an internal port.
system:	The system memory file system, which includes the running configuration.

File System	Description
tar:	The archive file system.
tmpsys:	The temporary system files file system.
usb0:	The Universal Serial Bus (USB) flash drive file systems on the active RSP. Note usb1: is an internal port.

If you see a file system not listed in the above table, enter the ? help option or see the **copy** command reference for additional information on that file system.

System Requirements

RP Memory Recommendations

Table 3: Memory Recommendations for the Cisco ASR 903 RSP1 Module - Consolidated Package Image

Platform	Image Name	Software Image	Individual Sub-package Contents	DRAM Memory
ASR 903 RSP1 Module	Cisco ASR 903 Series RSP1 UNIVERSAL W/O CRYPTO	asr903rsp1-universal.version.bin	asr903rsp1-rpbase.version.pkg	2 GB (RSP1)
			asr903rsp1-rpcontrol.version.pkg	4 GB (RSP1+)
			asr903rsp1-rpaccess.version.pkg	
			asr903rsp1-rpios-universal.version.pkg	
			asr903rsp1-espbase.version.pkg	
			asr903rsp1-sipbase.version.pkg	
			asr903rsp1-sipspa.version.pkg	
			asr903rsp1-packages-universal.version.conf	
			packages.conf	

Platform	Image Name	Software Image	Individual Sub-package Contents	DRAM Memory
ASR 903 RSP1 Module	Cisco ASR 903 Series RSP1 UNIVERSAL NPE	asr903rsp1-universalk9_npe. version .bin	asr903-hw-programmables. <i>version</i> .pkg	2 GB (RSP1) 4 GB (RSP1+)
			asr903rsp1-espbase. <i>version</i> .pkg	
			asr903rsp1-packages-universalk9. <i>version</i> .pkg	
			asr903rsp1-rpaccess. <i>version</i> .pkg	
			asr903rsp1-rpbase. <i>version</i> .pkg	
			asr903rsp1-rpcontrol. <i>version</i> .pkg	
			asr903rsp1-rpios-universalk9_npe. <i>version</i> .pkg	
			asr903rsp1-sipbase. <i>version</i> .pkg	
			asr903rsp1-sipspace. <i>version</i> .pkg	
			packages.conf	

Table 4: Memory Recommendations for the Cisco ASR 903 RSP2 Module - Consolidated Package Image

Platform	Image Name	Software Image	Individual Sub-package Contents
ASR 903 RSP2 Module	Cisco ASR 903 Series RSP2 UNIVERSAL W/O CRYPTO	asr900rsp2-universal. <i>version</i> .bin	asr900rsp2-rpbase. <i>version</i> .pkg
			asr900rsp2-rpcontrol. <i>version</i> .pkg
			asr900rsp2-rpaccess. <i>version</i> .pkg
			asr900rsp2-rpios-universal. <i>version</i> . pkg
			asr900rsp2-espbase. <i>version</i> .pkg
			asr900rsp2-sipbase. <i>version</i> .pkg
			asr900rsp2-sipspace. <i>version</i> .pkg
			asr900rsp2-packages-universal. version.conf
			packages.conf

Platform	Image Name	Software Image	Individual Sub-package Contents
ASR 903 RSP2 Module	Cisco ASR 903 Series RSP2 UNIVERSAL NPE	asr900rsp2-universalk9_npe. version .bin	asr900-hw-programmables.version .pkg
			asr900rsp2-espbase.version .pkg
			asr900rsp2-packages-universalk9.version .pkg
			asr900sp2-rpaccess.version .pkg
			asr900rsp2-rpbase.version .pkg
			asr900rsp2-rpcontrol.version .pkg
			asr900rsp2-rpios-universalk9_npe.version .pkg
			asr900rsp2-sipbase.version .pkg
			asr900rsp2-sipspa.version .pkg
			packages.conf

Table 5: Memory Recommendations for the Cisco ASR 900 RSP3 Module - Consolidated Package Image

Platform	Image Name	Software Image	Individual Sub-package Contents
ASR 900 RSP3 Module	Cisco ASR 900 Series RSP3 UNIVERSAL W/O CRYPTO	asr900rsp3-universal.version .bin	asr900rsp3-rpbase.version .pkg
			asr900rsp3-rpcontrol.version .pkg
			asr900rsp3-rpaccess.version .pkg
			asr900rsp3-rpios-universal.version .pkg
			asr900rsp3-espbase.version .pkg
			asr900rsp3-sipbase.version .pkg
			asr900rsp3-sipspa.version .pkg
			asr900rsp3-packages-universal.version.conf
			packages.conf

Platform	Image Name	Software Image	Individual Sub-package Contents
ASR 900 RSP3 Module	Cisco ASR 900 Series RSP3 UNIVERSAL NPE	asr900rsp3-universalk9_npe. version .bin	asr900-hw-programmables. <i>version</i> . pkg
			asr900rsp3-espbase. <i>version</i> .pkg
			asr900rsp3-packages-universalk9. <i>version</i> .pkg
			asr900rsp3-rpaccess. <i>version</i> .pkg
			asr900rsp3-rpbase. <i>version</i> .pkg
			asr900rsp3-rpcontrol. <i>version</i> .pkg
			asr900rsp3-rpios-universalk9_npe. <i>version</i> .pkg
			asr900rsp3-sipbase. <i>version</i> .pkg
			asr900rsp3-sipspa. <i>version</i> .pkg
			packages.conf

ROMMON Version Requirements

We recommend you to upgrade the ROMMON version to 15.6(33r)S.

For more information on the ROMMON package, see [Cisco Software Download](#).

Determining the Software Version

You can use the **show version installed** command to list the installed sub-packages on the router.

Autogenerated Files and Directories



Caution

Any autogenerated file in the bootflash: directory should not be deleted, renamed, moved, or altered in any way unless directed by customer support; altering these files can have unpredictable consequences for system performance.

Table 6: Autogenerated Files

File or Directory	Description
crashinfo files	A crashinfo file may appear in the bootflash: file system. Crashinfo files are useful for tuning and troubleshooting, but are not related to router operations: you can erase them without impacting the router's performance.

File or Directory	Description
core files	The bootflash/core directory is the storage area for .core files. Warning Do not erase or move the core directory.
lost+found directory	This directory is created on bootup if a system check is performed. Its appearance is completely normal and does not indicate any issues with the router.
tracelogs files	The storage area for trace files is bootflash/tracelogs. Trace files are useful for troubleshooting; you can access trace files using diagnostic mode to gather information related to the IOS failure. Warning Do not erase or move the tracelog directory.

Setting the Router to Boot in Sub-Package Mode



Note For instructions on how to download an image file, see [Downloading an Image, on page 13](#). In the following example, the image is located in the bootflash: Image/image-name.

Procedure

Step 1 **configure terminal**

Example:

```
Router# configure terminal
```

Enters configuration mode.

Step 2 **config-register**

Example:

```
Router(config)# config-register 0x2
```

Sets the configuration register so that the router boots using a specified image in NVRAM.

Step 3 **exit**

Example:

```
Router(config)#exit
```

Exits configuration mode and returns to the EXEC command interpreter prompt.

Step 4 **request platform software package expand file *source-URL* [*todestination-URL*] [**force**] [**verbose**] [**wipe**]**

Example:

```
Router# request platform software package expand file
stby-bootflash:Image/asr903rsp1-adventerprisek9.base.bin
```

Expands the consolidated image file on the standby RSP.

Note This step applies only if your router has a redundant RSP.

Step 5 **configure terminal**

Example:

```
Router# configure terminal
```

Enters configuration mode.

Step 6 **boot system flash [flash-fs:] [partition-number:] [filename]**

Example:

```
Router(config)# boot system bootflash:Image/packages.conf
```

Sets the router to boot using the packages.conf file.

Step 7 **exit**

Example:

```
Router(config)#exit
```

Exits configuration mode and returns to the EXEC command interpreter prompt.

Step 8 **copy running-config startup-config**

Example:

```
Router# copy running-config startup-config
```

Saves the configuration.

Step 9 **reload**

Example:

```
Router#reload
```

Reloads the router.

ISSU Support Matrix

Legend:

NA: Not Applicable

NS: Not Supported

Table 7: ISSU Support Matrix

Base IOS Version	Supported ISSU Upgrade Or Downgrade Version																	
	16.5.1	165X (X = 2,3)	166.1	166X (X = 2 to 6)	166X (X = 7 and later)	167X (X = 1 and later)	168X (X= 1)	168X (X=1)	169X (X= 3 and later)	169X (X= 1 and later)	169X (X= 1 and later)	171	173 ⁵	171	171	171	171	
165.1	NA	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
165X (X=2 and 3)	NS	NA	NS	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NS	NS	NS	NS	NS	NS
166.1	NS	NS	NA	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
166X (X=2 to 6)	NS	Yes	NS	Yes	Yes	Yes ¹	Yes ¹	Yes ¹	Yes	Yes ²	Yes	Yes ^B	Yes	Yes ^{3 1}	Yes ^{3 1}	Yes ^{3 1}	Yes ^{3 1}	Yes ^{3 1}
166X (X=7 and later)	NS	Yes	NS	Yes	Yes	Yes ¹	Yes ¹	Yes ¹	Yes	Yes ³	Yes	Yes ³	Yes ^{3 6}	Yes	Yes	Yes	Yes	Yes
167X (X = 1 and later)	NS	Yes	NS	Yes	Yes	NA	Yes	Yes	Yes	Yes	Yes	Yes ³	Yes ^{3 3}	Yes ^{3 6}	Yes ^{3 3}	Yes ^{3 3}	Yes ^{3 3}	Yes ^{3 3}
168X (X = 1)	NS	Yes	NS	NS	NS	Yes	NS	Yes	Yes	Yes	Yes	Yes ^{3 3}	Yes ^{3 3}	Yes ^{3 6}	Yes ^{3 3}	Yes ^{3 3}	Yes ^{3 3}	Yes ^{3 3}
169X (X = 1-2)	NS	Yes	NS	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes ^{3 3}	Yes ^{3 3}	Yes ^{3 6}	Yes ^{3 3}	Yes ^{3 3}	Yes ^{3 3}	Yes ^{3 3}
169X (X = 3 and later)	NS	Yes	NS	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes ⁶	Yes	Yes	Yes	Yes

	Supported ISSU Upgrade Or Downgrade Version																		
161X (X = 1 and later)	NS	Yes	NS	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NA	Yes	Yes	Yes ³	Yes ^{3 4} 6	Yes ^{3 4}	Yes ^{3 4}	Yes ^{3 4}	Yes ^{3 4}
16121	Yes	Yes	NS	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NA	Yes	Yes ⁶	Yes	Yes	Yes	Yes	Yes
17.1.1	NS	NS	NS	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NS	Yes	Yes ⁶	Yes	Yes	Yes	Yes	Yes
1731 ⁵	NS	NS	NS	NS	NS	NS	NS	NS	Yes	Yes	Yes	Yes	NA	Yes ⁶	Yes	Yes	Yes	Yes	Yes
1741 ⁶	NS	NS	NS	NS	NS	NS	NS	NS	Yes	Yes	Yes	Yes	Yes ⁶	NA	Yes	Yes	Yes	Yes	Yes
1751	NS	NS	NS	NS	NS	NS	NS	NS	Yes	Yes	Yes	Yes	Yes	Yes	NA	Yes	Yes	Yes	Yes
1761 ⁷	NS	NS	NS	NS	NS	NS	NS	NS	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NA	Yes	Yes	Yes
177.1	NS	NS	NS	NS	NS	NS	NS	NS	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NA	Yes	Yes
1781	NS	NS	NS	NS	NS	NS	NS	NS	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NA

¹ With CEM IMs the ISSU (upgrade) is not supported directly from Cisco IOS XE Release 16.6.x to 16.7.3 or 16.8.x or 16.9.x or 16.11.x, or 16.12.x release. ISSU upgrade should be done in two steps: First, upgrade from Cisco IOS XE Release 16.6.x to Cisco IOS XE Release 16.7.2. Then, upgrade from Cisco IOS XE Release 16.7.2 to the target release.

² Step ISSU (upgrade) to 17.1.1 with any of these images as intermediate image (16.9.3 and higher)

³ Step ISSU (upgrade) to 17.X.X with any of these images as intermediate image (16.9.3 or higher, 16.11.1 and 16.12.1)

⁴ Step ISSU (upgrade) to 17.x.x with any of these images as intermediate image (16.12.3)

⁵ The 17.3.1 image auto ROMMON upgrade enables the RSP for an additional reset during software upgrade if the RSP does not have the latest ROMMON version.

For more information, see

[Upgrading the Software on the Cisco ASR 900 Series Routers](#)

⁶ Upgrade ISSU from 16.x.x or 17.x.x to the 17.3.1 or 17.3.2 or 17.4.1 release using single-step ISSU upgrade.

⁷ The 17.6.1 image auto ROMMON upgrade enables the RSP for an additional reset during software upgrade if the RSP does not have the latest ROMMON version.

For more information, see

[Upgrading the Software on the Cisco ASR 900 Series Routers](#)

**Note**

- All phase 1 interface modules undergo FPGA upgrade during the ISSU to Cisco IOS XE 17.4.1 from any earlier releases. This impacts the traffic for that IM until the FPGA is upgraded and the IM comes up after reload.
- All phase 1 and phase 2 interface modules undergo FPGA upgrade during ISSU to Cisco IOS XE 17.8.1 from any earlier releases in RSP2 and RSP3. This impacts the traffic for that interface module until the FPGA is upgraded and the interface module comes up after reload.
- For the phase 1 interface module nodes which are ISSU upgraded from Cisco IOS XE 17.4.1 or later release to Cisco IOS XE 17.8.1, the traffic is not impacted.

Refer the following table for supported IMs:

Table 8: ASR 900 Supported Ethernet Interface Module

Phase 1 IM	Phase 2 IM	Phase 3 IM
A900-IMA8S	A900-IMA8S1Z	A900-IMA8Z
A900 -IMA8T	A900-IMA8T1Z	A900-IMA2F
A900-IMA1X	A900-IMA2Z	A900-IMA2C

Restrictions

- The ISSU upgrade operation requires that the ROMmon version be [15.6\(33r\)S](#) or higher for all releases starting from release Cisco IOS XE 16.11.x. For Cisco IOS XE Releases 16.6.x to 16.9.x, the minimum ROMmon version must be [15.6\(20r\)S](#).
- You must enable the **port-channel max-memlink-per-pc 8** command when downgrading from Cisco IOS XE Release 16.11.x else, ISSU will fail.
- For Cisco IOS XE Releases from 17.12.x, for ISSU upgrade, there's an increase in the ISSU upgrade duration when CEM scale on the IM is enabled for 5000 or more services.

Setting the Interface Module Delay for ISSU

Interface module delay refers to the duration that the system waits before enabling the new software on the upgraded interface modules. This delay is to ensure that all the interface modules have successfully synchronized with the new software before they are functioning.

The delay duration can vary depending on several factors, including the specific network device, the number of interface modules, and the complexity of the software upgrade being performed.

To set an optimum delay duration for the ISSU process, refer to the following table:

Interface Module	CEM FPD upgrade		FPD Upgrade (Seconds)	CEM & FPD Upgrade	
	CEM Scale	Upgrade Time (Seconds)		CEM Scale	Upgrade Time (Seconds)
A900-IMA48D-C	256	120	NA	256	240
	512	180		512	300
A900-IMA48T-C	672	180	NA	672	300
	1344	360		1344	480
A900-IMA3G-IMSG	672	300	NA	672	420
	1344	360		1344	480
A900-IMA1Z8S-CXMS	100	480	NA	100	660
	500	540		500	720
	1344	660		1344	840
	2500	840		2500	1020
	5000	1200		5000	1380
A900-IMA1Z8S-CX	100	420	NA	100	660
	500	420		500	720
	1344	540		1344	780
	2500	660		2500	900
	5000	900		5000	1140
A900-IMA8S	NA		62	NA	
A900- IMA8T	NA		63	NA	
A900-IMA1X	NA		88	NA	
A900-IMA8S1Z	NA		135	NA	
A900-IMA8T1Z	NA		136	NA	
A900-IMA2Z	NA		133	NA	
A900-IMA2F	NA		318	NA	
A900-IMA8Z	NA		406	NA	
A900-IMA1C	NA		328	NA	
A900-IMA2C	NA		330	NA	
A900-IMA8CS1Z-M	NA		405	NA	

For example, consider a router with four interface modules:

- A900-IMA48D-C with 512 CEM FPD upgrade
- A900-IMA1Z8S-CXMS with 1344 CEM FPD upgrade
- A900-IMA8CS1Z-M with FPD upgrade
- A900-IMA8T with no FPGA upgrade

The A900-IMA8T interface module won't reload due to no FPGA version upgrade. The remaining three interface modules reload during the ISSU process.

Compare the delay durations of the three interface modules and select the one with the longest duration. For example, the A900-IMA1Z8S-CXMS delay duration is 660 seconds, which is the longest compared to the delay durations of the other two interface modules.

Based on this information, set the delay duration to 660 seconds for the ISSU upgrade for this router.



Note For more information on FPGA versions, refer to the respective version release notes.

Downloading an Image

Download the image to the same partition of the bootflash where the base image exists. For information on downloading images see, [Loading and Managing System Images Configuration Guide, Cisco IOS XE Release 3S](#).



Note Ensure that you have chosen an upgrade image that is supported by your current software version.

Performing a Single Command Software Upgrade

A single command upgrade updates the active and standby RSPs with a single IOS command. Follow these steps to complete the one-shot upgrade.

Preparing for Installation

Verify the chassis is booted using sub-package mode and in hot standby state, else set the router to sub-package mode. For more information, see [Setting the Router to Boot in Sub-Package Mode, on page 7](#).

Procedure

- Step 1** Download the new image file from Cisco.com on the chassis.
- Step 2** Open a console session to the active RSP.

Step 3 Copy the new consolidated image file to the active image bootflash directory such that the new image file is in the same location as the existing image file.

Note Do not copy the packages.conf file to a new directory after expanding the package. It is required that the packages.conf file and sub package files exist in the same directory.

Note It is not necessary to copy the new consolidated image file to the standby RSP; the one-shot upgrade process completes this step.

Step 4 **configure terminal**

Example:

```
Router# configure terminal  
Enters configuration mode.
```

Step 5 **redundancy**

Example:

```
Router(config)# redundancy  
Router(config-red)#  
Enters redundancy configuration mode.
```

Step 6 **mode sso**

Example:

```
Router(config-red)# mode sso  
Sets the router in SSO redundancy mode.
```

Step 7 **end**

Example:

```
Router(config)# end  
Exits configuration mode and returns to the EXEC command prompt.
```

Step 8 Confirm that the router has reached SSO state

Example:

```
*Jan 12 17:52:26.516: %RF-5-RF_TERMINAL_STATE: Terminal state reached for (SSO)  
Wait for the output before proceeding.
```

Step 9 **copy running-config startup-config**

Example:

```
Router# copy running-config startup-config  
Saves the configuration.
```

Completing the Single Command Upgrade



Note Do *not* press CTRL+C when the single command upgrade is in process. The system shall reach the command prompt only after successful completion of the upgrade.



Note The Ethernet interface and TDM IM modules may reset, when firmware changes with the IOS image. The following TDM interface modules reset during the upgrade, irrespective of firmware changes with the IOS image:

- Cisco ASR 900 8 port RJ48C T1/E1 Interface Module
- Cisco ASR 900 16-Port T1/E1 Interface Module
- Cisco ASR 900 32-Port T1/E1 Interface Module
- Cisco ASR 900 Series 4-Port OC3/STM-1 or 1-Port OC12/STM-4 Module

Procedure

Step 1 (Optional) **platform issu reload interface-module sequence** *sequence of all IMs*

Reloads the interface modules in a sequence. Separate the IM numbers with a single space. If there are 16 IMs, sequence for all 16 IMs should be given, irrespective of the IMs being physically present or not. If the sequence is not configured using this command, the reload happens sequentially, by default.

Step 2 **request platform software package install node file** *file-URL* [**interface-module-delay** *delay*]

Example:

```
Router# request platform software package install node file
bootflash:Image/asr903rsp1-adventerprisek9.upgrade.bin interface-module-delay 150
```

Initiates the one-shot installation procedure using the consolidated image file.

Note You can adjust the delay between the OIR of each IM using the **interface-module-delay** keyword. We recommend you set the **interface-module-delay** value to 150 seconds or greater in order to ensure sufficient time for IM software upgrades. Keywords other than **interface-module-delay** are not supported.

Step 3 Wait for the router messages.

The router displays a series of STAGE/SUCCESS messages.

For sample output of a single command upgrade, see [Example: Single Command Software Upgrade, on page 37](#).

Step 4 Wait for original active RSP to reboot.

The active RSP reboots and returns to the console prompt.

- Step 5** Switch to the new active console.
- Step 6** Wait for new active console to return to SSO state

Example:

```
*Jan 12 17:52:26.516: %RF-5-RF_TERMINAL_STATE: Terminal state reached for (SSO)
```

Confirms that the router has reached SSO state; wait for this output before proceeding.

Performing Step-by-Step ISSU Upgrade



Note Ensure that the wildcard "-*." is used while installing the packages on the active RSP module (Step 8).

Procedure

- Step 1** Verify the chassis is booted using sub-package mode and in hot standby state, else set the router to sub-package mode, see [Setting the Router to Boot in Sub-Package Mode, on page 7](#).
- Step 2** Download the image on the chassis.
- Step 3** Extract the sub-package images from the `asr903rsp1-adventerprisek9.upgrade.bin` image on the active RSP using the **request platform software package expand file bootflash:Image/asr903rsp1-adventerprisek9.upgrade.bin** command.
- Step 4** Extract the sub-package image from the `asr903rsp1-adventerprisek9.upgrade.bin` image on the standby RSP using the **request platform software package expand file stby-bootflash:Image/asr903rsp1-adventerprisek9.upgrade.bin** command.
- Step 5** Upgrade all the sub-packages on the standby RSP using the **request platform software package install rp stby_slot_num file stby-bootflash:asr903rsp1-*.upgrade.pkg** command.
- Step 6** Reload the standby module from active RP using the **hw-module slot stby_slot_num reload** command and wait for the standby to reach Hot standby state.
- Step 7** (Optional) Reload the interface modules in a sequence using the **platform issu reload interface-module sequence sequence of all IMs** command.
- Separate the IM numbers with a single space. If there are 16 IMs, sequence for all 16 IMs should be given, irrespective of the IMs being physically present or not. If the sequence is not configured using this command, the reload happens sequentially, by default.
- Step 8** Execute the **request platform software package install rp active_slot_num file bootflash:asr903rsp1-sipsa.upgrade.pkg slot active_slot_num bay im_slot_num force** command for each IM present in the router.
- Note** The interface modules present are reset during the installation. Verify that the IM state is OK before proceeding to the next interface module.
- Step 9** Upgrade all the sub-packages on the active RSP using the **request platform software package install rp active_slot_num file bootflash:asr903rsp1-*.upgrade.pkg** command.
- Step 10** Perform a switchover. Wait for the new standby RSP module to reach hot standby state.

The latest image is upgraded on the router.

Note If you have missed the package installation on any of the IM in Step 7 and proceeded to Step 8, the packages are automatically installed for the missed IMs. The IMs may reset if the firmware changes in Step8.

Note ISSU from 16.9.x or 16.12.x release to 17.3.1 release and later is not supported directly. Ensure that you have the latest build and perform an ISSU from 16.9.3 release to 16.9.6 release or later, then to 17.3.1 release or later.

Software Upgrade Process Using Install Commands

Cisco ASR 900 Series Aggregation Services Routers support In-Service Software Upgrades (ISSU) procedure to upgrade the software. The *ISSU-using-install-cmds-for-RSP3* feature introduces a new method of software upgrade process by using the install command for Cisco ASR 903 Series Aggregation Services Routers.



Note Starting with Cisco IOS XE Amsterdam 17.3.1, the Install Workflow based ISSU method is supported on the Cisco RSP3 module .

Prerequisite

- Ensure that the standby RP is in the standby-hot state.
- Enable autoboot when using the install command so that the device is automatically reloaded with the configuration registry using the boot system command.

Guidelines

- Perform software upgrade process only during a maintenance window.
- Do not enable new features during a software upgrade process as it may require configuration changes.

Sub-Package Upgrade

Upgrading Software Using Step-By-Step Workflow

The step-by-step workflow involves, to add, activate, and commit the configuration. After activation, all the cards are upgraded to the new software version but does not commit automatically. You must manually commit using the install commit command. The advantage is that, it allows the system to roll back to a previous software version. The system automatically rolls back if the rollback timer is not stopped using the install abort-timer-stop command. If the rollback timer is stopped, then the new software version could be run on the device for any duration and then roll back to the previous version.

Procedure

Step 1 enable

Example:

```
Router> enable
```

Enables privileged EXEC mode.

- Enter your password if prompted.

Step 2 install add file {bootflash:| tftp:}

Example:

```
Router# install add tftp bootflash:
```

Downloads the image into the bootflash. The image is copied to the boot directory (boot_dir), the location where Route Processors (RPs) are booted.

Step 3 install activate issu [linecard-delay seconds]

Example:

```
Router# install activate issu
```

Provisions the standby RP with the new software and reloads with the new software version.

- linecard-delay *seconds* — Waits for a specified duration before upgrading the next slot.
- The rollback timer will be restarted.

Step 4 install commit

Example:

```
Router# install commit
```

Saves the configuration, performs the necessary clean-up, enables the new software as permanent (removing the older version of the software) and stops the rollback timer.

Note There is no rollback when this command is used.

Upgrading Software Using Single-Step Workflow

The single-step workflow involves, to add, activate, and commit the configuration. Rollback is not supported, as the upgrade is committed automatically.

Rollback

You can rollback the system before a commit. You can rollback a device to the initial stage using the **install abort issu** command or after the expiry of the rollback timer before the install commit command is used. If the install commit command is used, then rollback is not allowed.

Rollback involves the following:

- Provision and reset the standby RP.
- Provision and reset the active RP.

If the rollback timer is not stopped by using the **install abort stop-timer** command, the device rolls back to an earlier software version on expiry of the rollback timer. The default value of the rollback timer is 120 minutes.

The rollback timer value can be set via the **install activate location standby auto-abort-timer seconds** command.

Performing Single-Step Workflow

Procedure

Step 1

enable

Example:

```
Router> enable
```

Enables privileged EXEC mode.

- Enter your password if prompted.

Step 2

install add file {bootflash: | tftp: } activate issu [linecard-delay seconds] commit

Example:

```
Router# install add tftp bootflash: activate issu commit
```

Enables the standby RP with new software and triggers the standby RP to become active RP with new software version.

- *linecard-delay seconds* — Waits for a specified duration before upgrading the next slot.
 - *commit* — Saves the configuration, performs the necessary clean-up, enables the new software as permanent (removes the older version of the software) and stops the rollback timer. Any reboot after the commit, boots with the new software. There is no rollback when this keyword is used.
-

Tracking Software Upgrade

You can track the ISSU progress using the **show issu state detail** command.

Upgrading the ROMMON on the RSP3 Module

Table 9: Feature History

Feature Name	Release Information	Description
Secondary ROMMON Partition Auto Upgrade	Cisco IOS XE Bengaluru 17.4.1	This feature supports secondary ROMMON partition auto upgrade after a successful primary ROMMON partition is complete.

The router has two ROMMON regions (ROM0 and ROM1). We recommend that the upgrade is performed on both the regions.



Note We recommend that both region ROM0 and ROM1 are upgraded.

For Cisco IOS XE Gibraltar Release 16.9.5, Cisco IOS XE Gibraltar Release 16.12.3, and Cisco IOS XE Amsterdam 17.1.x, a minimum disk space of 2 MB is required in the boot flash memory file system for a successful ROMMON auto upgrade process. For a disk space lesser than 2 MB, ROMMON auto upgrade fails and the router reboots. This is applicable to Cisco ASR 903 and Cisco ASR 907 routers.

Routers running a ROMMON version that is lower than version 15.6(33r)S is auto upgraded to version 15.6(33r)S during a router restart. However, if a Cisco IOS XE release with ROMMON image is bundled with a version lower than the running ROMMON version, then the ROMMON is not auto downgraded.

While performing an auto upgrade of ROMMON, only primary partition is upgraded. Use the **upgrade rom-mon filename** command to upgrade the secondary partition of the ROMMON during the auto upgrade. However, the router can be reloaded during the next planned reload to complete the secondary rommon upgrade. This is applicable to ASR 903 and ASR 907 routers.

Starting with Cisco IOS XE Bengaluru Release 17.4.1, secondary ROMMON partition is auto upgraded after a successful primary ROMMON partition is complete. The router does not reload to complete the secondary ROMMON upgrade. The secondary ROMMON upgrade can be completed during planned reload of the router.

For Cisco IOS XE Gibraltar Release 16.9.4 with ROMMON release version 15.6(42r)S, ROMMON is secure. Once the ROMMON version is upgraded, it cannot be downgraded to a non-secure ROMMON version.



Caution To avoid actions that might make your system unable to boot, read this entire section before starting the upgrade.

Procedure

Step 1 Check the RSP bootup ROMMON region (ROM0 or ROM1). The example, shows the RSP boots up from ROM0 region.

Example:

Step 2 Copy the ROMMON image to the bootflash on the active and standby RSP.

Example:

```
copy bootflash:rsp3_rommon_156_33r_s.pkg
```

Step 3 Use the **upgrade rom-monitor filename** *bootflash:rsp3_rommon_156_33r_s.pkg* **R0** command to upgrade the version.

Note R0 represents RSP in slot0 of the chassis. Step 3 upgrades the ROMMON region of the RSP that is not used (ROM1 region) as ROM 0 region is used (in this procedure) in Step 1 to boot up the RSP.

Step 4 Upgrade the ROMMON on the Standby RSP (for High Availability) using **upgrade rom-monitor filename** *bootflash:rsp3_rommon_156_33r_s.pkg* **R1** command.

Note R1 represents the RSP in slot1 of the chassis. Step 4 upgrades the ROMMON region of the RSP that is not used (ROM 0 region).

Step 5 Reload the router.

Example:

```
System Bootstrap, Version 15.6(20r)S, RELEASE SOFTWARE (fc1)
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 2017 by cisco Systems, Inc.
Compiled Tue 23-May-17 07:20 by sabind
Starting Initialization of FMAN0
Loading ucode for FMAN0, size: 31424, ver: 106.04.14
fixup address:7ffff278 contentsoffixup:7ffff000
DCFG_CCSR_PORSR1(cfg_0_9 pins):22FB7F7F
RC Vendor ID[0x8241957]
PEX up stream Vendor ID[0x860910b5]
PEX down stream vendor ID [0x860910b5]
FPGA vendor ID[0x5f1137]
PCI Configuration done..
IOFPGA version[16040627]
```

```
Current image running: Boot ROM0
Last reset cause: RSP-Board
Rommon upgrade requested
Flash upgrade reset 1 in progress
.....BootPage Setting Done - Next DDR-init
```

```
System Bootstrap, Version 15.6(33r)S, RELEASE SOFTWARE (fc1)
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 2018 by cisco Systems, Inc.
Compiled Sat 06-Oct-18 23:23 by pallavik
Starting Initialization of FMAN0
Loading ucode for FMAN0, size: 31424, ver: 106.04.14
fixup address:7ffff278 contentsoffixup:7ffff000
DCFG_CCSR_PORSR1(cfg_0_9 pins):22FB7F7F
RC Vendor ID[0x8241957]
PEX up stream Vendor ID[0x860910b5]
PEX down stream vendor ID [0x860910b5]
FPGA vendor ID[0x5f1137]
PCI Configuration done..
IOFPGA version[16040627]
```

```
Current image running: *Upgrade in progress* Boot ROM1
Last reset cause: BootRomUpgrade
```

Example: Verifying ROMMON Upgrade for RSP3 Module

```
Configuring zarlink...
We're coming up from a flash upgrade reset cookie
UEA platform with 3670016 Kbytes of main memory

We're coming up from a flash upgrade reset cookie
RSP3#
```

Step 6 Reload the router again to confirm bootup from upgraded ROMMON region ROM1.

Example:

```
System Bootstrap, Version 15.6(33r)S, RELEASE SOFTWARE (fc1)
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 2018 by cisco Systems, Inc.
Compiled Sat 06-Oct-18 23:23 by pallavik
```

```
Current image running: Boot ROM1
```

Step 7 Repeat Step 3 to Step 6 to update the other region on the RSP (ROM0) region in this procedure.

Example: Verifying ROMMON Upgrade for RSP3 Module

Use the show platform command to verify the ROMMON upgrade.

```
Router# show platform
RSP3#show platform
Chassis type: ASR-903
```

Slot	Type	State	Insert time (ago)
0/0	A900-IMA1X	ok	00:18:41
0/1	A900-IMA2Z	ok	00:18:41
0/2	A900-IMA8S1Z	ok	00:18:40
0/3	A900-IMA8Z	ok	00:18:41
0/4	A900-IMA2F	ok	00:18:41
0/5	A900-IMA1C	ok	00:18:40
R0	A900-RSP3C-400-S	ok, active	00:20:48
R1	A900-RSP3C-400-S	ok, standby	00:20:48
F0		ok, active	00:20:48
F1		ok, standby	00:20:48
P0	A900-PWR1200-A	ok	00:19:59
P1	Unknown	N/A	never
P2	A903-FAN	ok	00:19:57

Slot	CPLD Version	Firmware Version
R0	16040627	15.6(33r)S
R1	16040627	15.6(33r)S
F0	16040627	15.6(33r)S
F1	16040627	15.6(33r)S

Upgrading the ROMMON on the RSP Module

Table 10: Feature History

Feature Name	Release Information	Description
Secondary ROMMON Partition Auto Upgrade	Cisco IOS XE Bengaluru 17.4.1	This feature supports secondary ROMMON partition auto upgrade after a successful primary ROMMON partition is complete for NCS 4216 routers.
Secondary ROMMON Version Auto Upgrade	Cisco IOS XE Bengaluru 17.5.1	After primary ROMMON version is auto upgraded, secondary ROMMON version auto upgrade process takes place. The secondary ROMMON upgrade is only completed during the next planned manual reload of the router. This is applicable to NCS 4201/4202 routers.

Starting with Cisco IOS XE Bengaluru release, 17.6.1, the 15.6(49r)S ROMMON version filters the restricted ROMMON variables during the bootup.

Starting with Cisco IOS XE Bengaluru release, 17.5.1, secondary ROMMON partition is also auto upgraded after a successful primary ROMMON partition upgrade is complete. You can reload the router at the next planned reload to complete the secondary ROMMON upgrade.



Note If the secondary ROMMON version is lesser than that of the primary ROMMON version, the secondary ROMMON gets auto upgraded.

For Cisco IOS XE Amsterdam Release 17.3.x, Cisco IOS XE Bengaluru Release 17.4.x, and earlier, the secondary ROMMON partition is not auto upgraded. You must manually upgrade it using the **upgrade rom-mon filename** command.

Starting with ROMMON release version 15.6(43r)S, ROMMON version is secure. Once the ROMMON version is upgraded, it cannot be downgraded to a non-secure ROMMON version.

Secure ROMMON is supported from Cisco IOS XE Amsterdam Release 17.3.1 onwards. However, it is compatible with all the releases.

Any future secure ROMMON upgrade or downgrade is only possible from Cisco IOS XE Amsterdam Release 17.3.1 onwards.

Any non-secure FPGA bundled releases moving to Cisco IOS XE Bengaluru Release 17.3.x or future releases can result in an FPGA upgrade and a ROMMON upgrade. If FPGA upgrade happens parallelly with the ROMMON upgrade, you can only expect a single reload. If FPGA upgrade gets delayed and happens post ROMMON upgrade, two reloads are expected to complete both the upgrade processes. This is followed by a successful bootup of the target release image.

The router has two ROMMON regions (ROM0 and ROM1). We recommend that the upgrade is performed on both the regions.



Note For Cisco IOS XE Gibraltar Release 16.9.5, Cisco IOS XE Gibraltar Release 16.12.3, Cisco IOS XE Amsterdam 17.1.x, and Cisco IOS XE Amsterdam 17.3.1, a minimum disk space of 2 MB is required in the boot flash memory file system for a successful ROMMON auto upgrade process. For a disk space lesser than 2 MB, ROMMON auto upgrade fails and the router reboots.



Note Routers running a ROMMON version that is lower than version 15.6(33r)S is auto upgraded to version 15.6(33r)S during a router restart. However, if a Cisco IOS XE release with ROMMON image is bundled with a version lower than the running ROMMON version, then the ROMMON is not auto downgraded.



Note Before installing the Cisco IOS XE Amsterdam 17.3.1, you *must* upgrade the ROMMON to version 15_6_43r_s or higher to avoid bootup failure. This is applicable to NCS 4202 routers.



Note Starting with Cisco IOS XE Amsterdam 17.3.1, While performing an auto upgrade of ROMMON, only primary partition is upgraded. Use the **upgrade rom-mon filename** command to upgrade the secondary partition of the ROMMON. However, the router can be reloaded during the next planned reload to complete the secondary ROMMON upgrade.



Caution To avoid actions that might make your system unable to boot, read this entire section before starting the upgrade.

Procedure

Step 1 Check the RSP bootup ROMMON region (ROM0 or ROM1). The example, shows the RSP boots up from ROM0 region.

Example:

```
System Bootstrap, Version 15.2(1r)S1, RELEASE SOFTWARE (fc1)
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 2011 by cisco Systems, Inc.
Compiled Wed 07-Dec-11 07:33 by tinhuang
Current image running: Boot ROM0
```

Step 2 Copy the ROMMON image to the bootflash on the active and standby RSP.

Example:


```
copy bootflash:asr903-rommon.153-1r.S1.pkg
```

Step 3 Use the **upgrade rom-monitor filename** *bootflash:asr903-rommon.153-1r.S1.pkg* **R0** command to upgrade the version.

Note R0 represents RSP in slot0 of the chassis. Step 3 upgrades the ROMMON region of the RSP that is not used (ROM1 region) as ROM 0 region is used (in this procedure) in Step 1 to boot up the RSP.

Step 4 Upgrade the ROMMON on the Standby RSP (for High Availability) using **upgrade rom-monitor filename** *bootflash:asr903-rommon.153-1r.S1.pkg* **R1** command.

Note R1 represents the RSP in slot1 of the chassis. Step 4 upgrades the ROMMON region of the RSP that is not used (ROM 0 region).

Step 5 Reload the router.

Example:

```
System Bootstrap, Version 15.2(1r)S1, RELEASE SOFTWARE (fc1)
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 2011 by cisco Systems, Inc.
Compiled Wed 07-Dec-11 07:33 by tinhuang
Current image running: Boot ROM0
Last reset cause: RSP-Board
UEA platform with 2097152 Kbytes of main memory
Rommon upgrade requested
Flash upgrade reset 1 in progress
.....
System Bootstrap, Version 12.2(20120514:121217) [npenumar-pegasus_rommon_02 183], DEVELOPMENT
SOFTWARE
Copyright (c) 1994-2008 by cisco Systems, Inc.
Compiled Fri 15-Jun-12 11:45 by ccai
Current image running: *Upgrade in progress* Boot ROM1
Last reset cause: BootRomUpgrade
UEA platform with 2097152 Kbytes of main memory
```

Step 6 Reload the router again to confirm bootup from upgraded ROMMON region ROM1.

Example:

```
System Bootstrap, Version 15.2(1r)S1, RELEASE SOFTWARE (fc1)
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 2011 by cisco Systems, Inc.
Compiled Fri 15-Jun-12 11:45 by ccai
Current image running: Boot ROM1
```

Step 7 Repeat Step 3 to Step 6 to update the other region on the RSP (ROM0) region in this procedure.

Note We recommend that both region ROM0 andROM1 are upgraded.

Example: Verifying ROMMON Upgrade

Use the show platform command to verify the ROMMON upgrade.

```
Router# show platform
```

```
Chassis type: ASR-903
```

Slot	Type	State	Insert time (ago)
0/0	A900-IMA1X	ok	04:48:07
0/1	A900-IMA1X	ok	04:43:42
0/4	A900-IMA8T	ok	05:18:21
0/5	A900-IMA8T	ok	05:18:21
R0	A903-RSP1A-55	ok, active	05:23:11
R1	A903-RSP1A-55	ok, standby	05:23:11
F0		ok, active	05:23:11
F1		ok, standby	05:23:11
P0	A900-PWR550-D	ok	05:20:02
P1	A900-PWR550-D	ok	05:19:55
P2	A903-FAN	ok	05:19:45
Slot	CPLD Version	Firmware Version	
R0	11102133	15.3(1r)S1	
R1	11102133	15.3(1r)S1	
F0	11102133	15.3(1r)S1	
F1	11102133	15.3(1r)S1	

Verifying the Upgrade

Example: Single Command Software Upgrade for RSP3 Module

```
Router#$request platform software package install node file
bootflash:issu/asr900rsp3-universalk9_npe.16.12.01prd15.SPA.bin interface-module-delay 150
NOTE: Currently node has booted from a provisioning file
NOTE: Going to start a dual rp sub-packages node ISSU install

--- Starting disk space verification ---
Finished disk space verification

--- Starting initial file path checking ---
Copying bootflash:/issu/asr900rsp3-universalk9_npe.16.12.01prd15.SPA.bin to
stby-bootflash:/issu/asr900rsp3-universalk9_npe.16.12.01prd15.SPA.bin
Finished initial file path checking

--- Starting config-register verification ---
Finished config-register verification

--- Starting image file expansion ---
Expanding image file: bootflash:/issu/asr900rsp3-universalk9_npe.16.12.01prd15.SPA.bin

*Jul 26 08:03:51.807: %INSTALL-5-OPERATION_START_INFO: R0/0: packtool: Started expand package
bootflash:/issu/asr900rsp3-universalk9_npe.16.12.01prd15.SPA.bin
*Jul 26 08:05:42.842: %LINK-3-UPDOWN: Interface TenGigabitEthernet0/5/1, changed state to
up
*Jul 26 08:05:42.843: %IOSXE_RP_ALARM-6-INFO: cleared CRITICAL TenGigabitEthernet0/5/1:
Physical Port Link Down
*Jul 26 08:05:43.543: %LINEPROTO-5-UPDOWN: Line protocol on Interface TenGigabitEthernet0/5/1,
changed state to up
*Jul 26 08:06:12.795: %LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/4/6,
changed state to up
*Jul 26 08:06:14.189: %LINK-3-UPDOWN: Interface GigabitEthernet0/4/6, changed state to up
*Jul 26 08:06:14.192: %IOSXE_RP_ALARM-6-INFO: cleared CRITICAL GigabitEthernet0/4/6: Physical
Port Link Down
```

```
*Jul 26 08:06:14.210: %LINK-3-UPDOWN: Interface BDI500, changed state to up
*Jul 26 08:06:14.910: %LINEPROTO-5-UPDOWN: Line protocol on Interface BDI500, changed state
to upImage file expanded and copied
Expanding image file: stby-bootflash:/issu/asr900rsp3-universalk9_npe.16.12.01prd15.SPA.bin

*Jul 26 08:09:11.903: %INSTALL-5-OPERATION_COMPLETED_INFO: R0/0: packtool: Completed expand
package bootflash:/issu/asr900rsp3-universalk9_npe.16.12.01prd15.SPA.bin
*Jul 26 08:09:18.982: %INSTALL-5-OPERATION_START_INFO: R1/0: packtool: Started expand package
bootflash:/issu/asr900rsp3-universalk9_npe.16.12.01prd15.SPA.binImage file expanded and
copied
Finished image file expansion

STAGE 1: Installing software on standby RP
=====

*Jul 26 08:14:46.426: %INSTALL-5-OPERATION_COMPLETED_INFO: R1/0: packtool: Completed expand
package bootflash:/issu/asr900rsp3-universalk9_npe.16.12.01prd15.SPA.bin--- Starting install
local lock acquisition on R0 ---
Finished install local lock acquisition on R0

--- Starting local lock acquisition on R0 ---
Finished local lock acquisition on R0

--- Starting installation state synchronization ---
Finished installation state synchronization

*Jul 26 08:14:49.404: %INSTALL-5-OPERATION_START_INFO: R0/0: provision: Started install
package stby-bootflash:issu/*rsp3-*16.12.01prd15.SPA*.pkg--- Starting install local lock
acquisition on R1 ---

Finished install local lock acquisition on R1

--- Starting local lock acquisition on R1 ---

Finished local lock acquisition on R1

--- Starting file path checking ---

*Jul 26 08:14:55.232: %INSTALL-5-OPERATION_START_INFO: R1/0: provision: Started install
package stby-bootflash:issu/*rsp3-*16.12.01prd15.SPA*.pkgFinished file path checking

--- Starting image file verification ---

Checking image file names

Locating image files and validating name syntax

Found asr900rsp3-espbase.16.12.01prd15.SPA.pkg

Found asr900rsp3-rpaccess.16.12.01prd15.SPA.pkg

Found asr900rsp3-rpbase.16.12.01prd15.SPA.pkg

Found asr900rsp3-rpboot.16.12.01prd15.SPA.pkg

Found asr900rsp3-rpcontrol.16.12.01prd15.SPA.pkg
```

```
Found asr900rsp3-rpios-universalk9_npe.16.12.01prd15.SPA.pkg
Found asr900rsp3-sipbase.16.12.01prd15.SPA.pkg
Found asr900rsp3-sipsa.16.12.01prd15.SPA.pkg
Verifying image file locations
Inspecting image file types
    WARNING: In-service installation of IOSD package
    WARNING: requires software redundancy on target RP
    WARNING: or on-reboot parameter
    WARNING: Automatically setting the on-reboot flag
    WARNING: In-service installation of RP Base package
    WARNING: requires software reboot of target RP
Processing image file constraints
Creating candidate provisioning file
Finished image file verification

--- Starting candidate package set construction ---
Verifying existing software set
Processing candidate provisioning file
Constructing working set for candidate package set
Constructing working set for running package set
Checking command output
Constructing merge of running and candidate packages
Checking if resulting candidate package set would be complete
Finished candidate package set construction

--- Starting ISSU compatibility verification ---
Verifying image type compatibility
Checking IPC compatibility for candidate software
Checking candidate package set infrastructure compatibility
Checking infrastructure compatibility with running software
Checking infrastructure compatibility with running software ... skipped
Checking package specific compatibility
```

```
Finished ISSU compatibility verification
```

```
--- Starting list of software package changes ---
```

```
Old files list:
```

```
Removed asr900rsp3-espbase.16.11.01a.SPA.pkg
Removed asr900rsp3-rpaccess.16.11.01a.SPA.pkg
Removed asr900rsp3-rpbase.16.11.01a.SPA.pkg
Removed asr900rsp3-rpboot.16.11.01a.SPA.pkg
Removed asr900rsp3-rpcontrol.16.11.01a.SPA.pkg
Removed asr900rsp3-rpios-universalk9_npe.16.11.01a.SPA.pkg
Removed asr900rsp3-sipbase.16.11.01a.SPA.pkg
Removed asr900rsp3-sipspa.16.11.01a.SPA.pkg
```

```
New files list:
```

```
Added asr900rsp3-espbase.16.12.01prd15.SPA.pkg
Added asr900rsp3-rpaccess.16.12.01prd15.SPA.pkg
Added asr900rsp3-rpbase.16.12.01prd15.SPA.pkg
Added asr900rsp3-rpboot.16.12.01prd15.SPA.pkg
Added asr900rsp3-rpcontrol.16.12.01prd15.SPA.pkg
Added asr900rsp3-rpios-universalk9_npe.16.12.01prd15.SPA.pkg
Added asr900rsp3-sipbase.16.12.01prd15.SPA.pkg
Added asr900rsp3-sipspa.16.12.01prd15.SPA.pkg
```

```
Finished list of software package changes
```

```
--- Starting commit of software changes ---
```

```
Updating provisioning rollback files
```

```
Creating pending provisioning file
```

```
Committing provisioning file
```

```
Finished commit of software changes
```

```
SUCCESS: Software provisioned. New software will load on reboot.
```

```
*Jul 26 08:22:34.205: %INSTALL-5-OPERATION_COMPLETED_INFO: R1/0: provision: Completed install
package stby-bootflash:issu/*rsp3-*16.12.01prd15.SPA*.pkg
```

Example: Single Command Software Upgrade for RSP3 Module

```

*Jul 26 08:22:40.703: %INSTALL-5-OPERATION_COMPLETED_INFO: R0/0: provision: Completed install
package stby-bootflash:issu/*rsp3-*16.12.01prd15.SPA*.pkgSTAGE 2: Restarting standby RP
=====
--- Starting standby reload ---
Finished standby reload

--- Starting wait for Standby RP to reach terminal redundancy state ---

*Jul 26 08:22:51.278: %IOSXE_OIR-6-OFFLINECARD: Card (rp) offline in slot R1
*Jul 26 08:22:51.294: %IOSXE_RP_ALARM-6-INFO: asserted MAJOR module R1: Boot state
*Jul 26 08:22:51.316: %IOSXE_OIR-6-OFFLINECARD: Card (fp) offline in slot F1
*Jul 26 08:22:51.371: %REDUNDANCY-3-STANDBY_LOST: Standby processor fault (PEER_NOT_PRESENT)
*Jul 26 08:22:51.371: %IOSXE_RP_ALARM-6-INFO: asserted MAJOR module R0: Secondary removed
*Jul 26 08:22:51.372: %REDUNDANCY-3-STANDBY_LOST: Standby processor fault (PEER_DOWN)
*Jul 26 08:22:51.374: %REDUNDANCY-3-STANDBY_LOST: Standby processor fault
(Peer_Redundancy_State_Change)
*Jul 26 08:22:54.074: %RF-5-RF_RELOAD: Peer reload. Reason: EHSA standby down
*Jul 26 08:22:55.376: %IOSXE_RP_ALARM-6-INFO: cleared MAJOR module R1: Boot state
*Jul 26 08:22:55.377: %IOSXE_RP_ALARM-6-INFO: asserted MAJOR module R1: Unknown state
*Jul 26 08:22:55.437: %IOSXE_OIR-6-REMCARD: Card (rp) removed from slot R1
*Jul 26 08:22:55.438: %IOSXE_RP_ALARM-6-INFO: asserted CRITICAL slot R1: RP Removed OIR
Alarm
*Jul 26 08:22:55.438: %ALARM-3-CLEAR: cleared MAJOR module R1 Unknown state
*Jul 26 08:22:55.540: %IOSXE_OIR-6-REMCARD: Card (fp) removed from slot F1
*Jul 26 08:22:55.642: %IOSXE_OIR-6-REMCARD: Card (cc) removed from slot 1
*Jul 26 08:22:55.407: %CMRP-6-FP_HA_STATUS: R0/0: cmand: F0 redundancy state is Active with
no Standby
*Jul 26 08:22:55.412: %CMRP-6-RP_SB_RELOAD_REQ: R0/0: cmand: Reloading Standby RP: initiated
by RF reload message
*Jul 26 08:23:06.692: %IOSXE_OIR-6-INSCARD: Card (rp) inserted in slot R1
*Jul 26 08:23:06.693: %IOSXE_RP_ALARM-6-INFO: cleared CRITICAL slot R1: RP Removed OIR Alarm

*Jul 26 08:23:06.694: %IOSXE_OIR-6-INSCARD: Card (fp) inserted in slot F1
*Jul 26 08:23:06.702: %IOSXE_OIR-6-INSCARD: Card (cc) inserted in slot 1
*Jul 26 08:23:06.703: %IOSXE_RP_ALARM-6-INFO: asserted MAJOR module R1: Unknown state
*Jul 26 08:23:18.288: %IOSXE_RP_ALARM-6-INFO: cleared MAJOR module R1: Unknown state
*Jul 26 08:23:18.289: %IOSXE_RP_ALARM-6-INFO: asserted MAJOR module R1: Boot state
*Jun 7 22:58:01.164: %IOSXE-3-PLATFORM: R1/0: kernel: pci 0001:06:00.0: of_irq_parse_pci()
failed with rc=-22
*Jun 7 22:58:01.169: %IOSXE-3-PLATFORM: R1/0: kernel: pci 0001:06:00.1: of_irq_parse_pci()
failed with rc=-22
*Jun 7 22:58:01.184: %IOSXE-3-PLATFORM: R1/0: kernel: pci 0001:06:00.0: of_irq_parse_pci()
failed with rc=-22
*Jun 7 22:58:01.185: %IOSXE-3-PLATFORM: R1/0: kernel: pci 0001:06:00.0: of_irq_parse_pci()
failed with rc=-22
*Jun 7 22:58:01.185: %IOSXE-3-PLATFORM: R1/0: kernel: pci 0001:06:00.0: of_irq_parse_pci()
failed with rc=-22
*Jun 7 22:58:01.186: %IOSXE-3-PLATFORM: R1/0: kernel: pci 0001:06:00.0: of_irq_parse_pci()
failed with rc=-22
*Jun 7 22:58:01.188: %IOSXE-3-PLATFORM: R1/0: kernel: pci 0001:06:00.0: of_irq_parse_pci()
failed with rc=-22
*Jun 7 22:58:01.190: %IOSXE-3-PLATFORM: R1/0: kernel: pci 0001:06:00.0: of_irq_parse_pci()
failed with rc=-22
*Jun 7 22:58:01.191: %IOSXE-3-PLATFORM: R1/0: kernel: pci 0001:06:00.0: of_irq_parse_pci()
failed with rc=-22
*Jun 7 22:58:01.460: %IOSXE-3-PLATFORM: R1/0: kernel: pci 0001:0e:00.0: BAR 0: error
updating (high 0x00000f != 0x000000)
*Jun 7 22:58:01.508: %IOSXE-3-PLATFORM: R1/0: kernel: mdio_bus ffb4fc000: MDIO device at
address 3 is missing.
*Jun 7 22:58:01.509: %IOSXE-3-PLATFORM: R1/0: kernel: mdio_bus ffb4fc000: MDIO device at
address 4 is missing.
*Jul 26 08:29:51.405: %IOSXE_OIR-6-ONLINECARD: Card (rp) online in slot R1
*Jul 26 08:29:51.430: %IOSXE_RP_ALARM-6-INFO: cleared MAJOR module R1: Boot state
*Jul 26 08:30:01.032: %SYSHW-3-SYSHW_REG_READ: R0/0: emd: A register read operation has

```

```

failed for device: I2C_FAN_CTRL register: /sys/bus/i2c/devices/21-0020/temp1_input error:
Invalid argument
*Jul 26 08:30:02.253: %IOSXE_OIR-6-ONLINECARD: Card (cc) online in slot 1
*Jul 26 08:30:02.265: %IOSXE_OIR-6-OFFLINECARD: Card (cc) offline in slot 1
*Jul 26 08:30:09.134: %IOSXE_OIR-6-ONLINECARD: Card (fp) online in slot F1
*Jul 26 08:30:33.646: %IOSXE-3-PLATFORM: R1/0: kernel: pcieport 0000:01:00.0:
of_irq_parse_pci() failed with rc=-22
*Jul 26 08:31:37.600: %IOSXE-3-PLATFORM: R1/0: uea_mgr: QDR 0 is Ready
*Jul 26 08:31:58.698: %REDUNDANCY-5-PEER_MONITOR_EVENT: Active detected a standby insertion
(raw-event=PEER_FOUND(4))

*Jul 26 08:31:58.698: %IOSXE_RP_ALARM-6-INFO: cleared MAJOR module R0: Secondary removed
*Jul 26 08:31:58.699: %REDUNDANCY-5-PEER_MONITOR_EVENT: Active detected a standby insertion
(raw-event=PEER_REDUNDANCY_STATE_CHANGE(5))

*Jul 26 08:32:01.578: %REDUNDANCY-3-IPC: IOS versions do not match.

*Jul 26 08:32:02.483: %HA_EM-6-LOG: Mandatory.uearp_stby_ios_mismatch_eem.tcl: AUTOMATIC
UPGRADE: CHASSIS IS NOT NCS. HENCE ABORTING AUTOMATIC UPGRADE
*Jul 26 08:32:23.494: %CMRP-6-FP_HA_STATUS: R1/0: cmand: F0 redundancy state is Active with
ready Standby
*Jul 26 08:32:23.669: %CMRP-6-FP_HA_STATUS: R0/0: cmand: F0 redundancy state is Active with
ready Standby
*Jul 26 08:32:56.373: %IOSXE_OIR-6-INSCARD: Card (cc) inserted in slot 1
*Jul 26 08:33:57.534: %ISSU-3-INCOMPATIBLE_PEER_UID: Setting image
(PPC_LINUX_IOSD-UNIVERSALK9_NPE-M), version (16.12.1prd15) on peer uid (49) as incompatible
*Jul 26 08:33:57.534: Config Sync: Bulk-sync failure due to Servicing Incompatibility.
Please check full list of mismatched commands via:
    show redundancy config-sync failures mcl

*Jul 26 08:33:57.534: Config Sync: Starting lines from MCL file:
-line aux 0
    ! <submode> "line"
    stopbits 1
    ! </submode> "line"

*Jul 26 08:33:58.540: %RF-5-RF_TERMINAL_STATE: Terminal state reached for (SSO)Finished
wait for Standby RP to reach terminal redundancy state

STAGE 3: Installing sipspa package on local RP
=====
--- Starting install local lock acquisition on R0 ---
Finished install local lock acquisition on R0

--- Starting local lock acquisition on R0 ---
Finished local lock acquisition on R0

--- Starting installation state synchronization ---
Finished installation state synchronization

--- Starting file path checking ---

*Jul 26 08:34:03.729: %INSTALL-5-OPERATION_START_INFO: R0/0: provision: Started install
package bootflash:issu/*rsp3-sipspa*16.12.01prd15.SPA*.pkgFinished file path checking

--- Starting image file verification ---
Checking image file names
Locating image files and validating name syntax
    Found asr900rsp3-sipspa.16.12.01prd15.SPA.pkg
Verifying image file locations
Inspecting image file types
Processing image file constraints
Creating candidate provisioning file
Finished image file verification

```

Example: Single Command Software Upgrade for RSP3 Module

```

--- Starting candidate package set construction ---
Verifying existing software set
Processing candidate provisioning file
Constructing working set for candidate package set
Constructing working set for running package set
Checking command output
Constructing merge of running and candidate packages
Checking if resulting candidate package set would be complete
Finished candidate package set construction

--- Starting ISSU compatibility verification ---
Verifying image type compatibility
Checking IPC compatibility with running software
Checking candidate package set infrastructure compatibility
Checking infrastructure compatibility with running software
Checking package specific compatibility
Finished ISSU compatibility verification

--- Starting impact testing ---
Checking operational impact of change
Finished impact testing

--- Starting list of software package changes ---
Old files list:
  Removed asr900rsp3-sipspa.16.11.01a.SPA.pkg
New files list:
  Added asr900rsp3-sipspa.16.12.01prd15.SPA.pkg
Finished list of software package changes

--- Starting commit of software changes ---
Updating provisioning rollback files
Creating pending provisioning file
Committing provisioning file
Finished commit of software changes

--- Starting analysis of software changes ---
Finished analysis of software changes

--- Starting update running software ---
Blocking peer synchronization of operating information
Creating the command set placeholder directory
  Finding latest command set
  Finding latest command shortlist lookup file
  Finding latest command shortlist file
  Assembling CLI output libraries
  Assembling CLI input libraries
  Assembling Dynamic configuration files
  Applying interim IPC and database definitions
  Replacing running software
  Replacing CLI software
  Restarting software
ISSU Sequence file found.
  Processing IM: 0/0
  ETA to Process Next IM: 160 seconds
  Processing IM: 0/1
  ETA to Process Next IM: 160 seconds
  Processing IM: 0/2
  ETA to Process Next IM: 160 seconds
  Processing IM: 0/3
  ETA to Process Next IM: 160 seconds
  Processing IM: 0/4
  ETA to Process Next IM: 160 seconds
  Processing IM: 0/5

```



```
ETA to Process Next IM: 160 seconds
Applying final IPC and database definitions
Generating software version information
Notifying running software of updates
Unblocking peer synchronization of operating information
Cleaning temporary installation files
Finished update running software

SUCCESS: Finished installing software.

*Jul 26 09:00:23.807: %INSTALL-5-OPERATION_COMPLETED_INFO: R0/0: provision: Completed install
package bootflash:issu/*rsp3-sipspa*16.12.01prd15.SPA*.pkgSTAGE 4: Installing software on
active RP
=====
--- Starting install local lock acquisition on R0 ---
Finished install local lock acquisition on R0

--- Starting local lock acquisition on R0 ---
Finished local lock acquisition on R0

--- Starting installation state synchronization ---
Finished installation state synchronization

--- Starting file path checking ---

*Jul 26 09:00:31.390: %INSTALL-5-OPERATION_START_INFO: R0/0: provision: Started install
package bootflash:issu/*rsp3-*16.12.01prd15.SPA*.pkgFinished file path checking

--- Starting image file verification ---
Checking image file names
Locating image files and validating name syntax
Found asr900rsp3-espbase.16.12.01prd15.SPA.pkg
Found asr900rsp3-rpaccess.16.12.01prd15.SPA.pkg
Found asr900rsp3-rpbase.16.12.01prd15.SPA.pkg
Found asr900rsp3-rpboot.16.12.01prd15.SPA.pkg
Found asr900rsp3-rpcontrol.16.12.01prd15.SPA.pkg
Found asr900rsp3-rpios-universalk9_npe.16.12.01prd15.SPA.pkg
Found asr900rsp3-sipbase.16.12.01prd15.SPA.pkg
Found asr900rsp3-sipspa.16.12.01prd15.SPA.pkg
Verifying image file locations
Inspecting image file types
WARNING: In-service installation of IOSD package
WARNING: requires software redundancy on target RP
WARNING: or on-reboot parameter
WARNING: Automatically setting the on-reboot flag
WARNING: In-service installation of RP Base package
WARNING: requires software reboot of target RP
Processing image file constraints
Creating candidate provisioning file
Finished image file verification

--- Starting candidate package set construction ---
Verifying existing software set
Processing candidate provisioning file
Constructing working set for candidate package set
Constructing working set for running package set
Checking command output
Constructing merge of running and candidate packages
Checking if resulting candidate package set would be complete
Finished candidate package set construction

--- Starting ISSU compatibility verification ---
Verifying image type compatibility
Checking IPC compatibility for candidate software
```

Example: Single Command Software Upgrade for RSP3 Module

```

Checking candidate package set infrastructure compatibility
Checking infrastructure compatibility with running software
Checking infrastructure compatibility with running software ... skipped
Checking package specific compatibility
Finished ISSU compatibility verification

--- Starting list of software package changes ---
Old files list:
  Removed asr900rsp3-espbase.16.11.01a.SPA.pkg
  Removed asr900rsp3-rpaccess.16.11.01a.SPA.pkg
  Removed asr900rsp3-rpbase.16.11.01a.SPA.pkg
  Removed asr900rsp3-rpboot.16.11.01a.SPA.pkg
  Removed asr900rsp3-rpcontrol.16.11.01a.SPA.pkg
  Removed asr900rsp3-rpios-universalk9_npe.16.11.01a.SPA.pkg
  Removed asr900rsp3-sipbase.16.11.01a.SPA.pkg
New files list:
  Added asr900rsp3-espbase.16.12.01prd15.SPA.pkg
  Added asr900rsp3-rpaccess.16.12.01prd15.SPA.pkg
  Added asr900rsp3-rpbase.16.12.01prd15.SPA.pkg
  Added asr900rsp3-rpboot.16.12.01prd15.SPA.pkg
  Added asr900rsp3-rpcontrol.16.12.01prd15.SPA.pkg
  Added asr900rsp3-rpios-universalk9_npe.16.12.01prd15.SPA.pkg
  Added asr900rsp3-sipbase.16.12.01prd15.SPA.pkg
Finished list of software package changes

--- Starting commit of software changes ---
Updating provisioning rollback files
Creating pending provisioning file
Committing provisioning file
Finished commit of software changes

SUCCESS: Software provisioned.  New software will load on reboot.

*Jul 26 09:07:55.045: %INSTALL-5-OPERATION_COMPLETED_INFO: R0/0: provision: Completed install
package bootflash:issu/*rsp3-*16.12.01prd15.SPA*.pkgSTAGE 5: Restarting active RP (switchover
to stdby)
=====
--- Starting active reload ---
Finished active reload

SUCCESS: node ISSU finished successfully.
Jul 26 09:08:04.327: %PMAN-5-EXITACTION: F0/0: pvp: Process manager is exiting: process
exit with reload fru code
Jul 26 09:08:05.622: %PMAN-5-EXITACTION: R0/0: pvp: Process manage

BootPage Setting Done - Next DDR-init

System Bootstrap, Version 15.6(33r)S, RELEASE SOFTWARE (fc1)

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Compiled Sat 06-Oct-18 23:23 by pallavik

Starting Initialization of FMAN0

Loading ucode for FMAN0, size: 31424, ver: 106.04.14

fixup address:7ffff278 contentsoffixup:7ffff000

DCFG_CCSR_PORSR1(cfg_0_9 pins):22FB7F7F

```

```
RC Vendor ID[0x8241957]
PEX up stream Vendor ID[0x860910b5]
PEX down stream vendor ID [0x860910b5]
FPGA vendor ID[0x5f1137]
PCI Configuration done..
IOFPGA version[19052734]

Current image running: Boot ROM0
Last reset cause: RSP-Board
Configuring zarlink...
C-Inlet temp 40C
ARAD-0 temp 55C
UEA platform with 3670016 Kbytes of main memory

Checking eUSB devices..
USB PHY clock valid[0x20000]
USB0:  USB EHCI 1.00
allocating the qtd buffer..
scanning bus 0 for devices... port 1 connection change
hub_port_reset: resetting port 0...
STAT_C_CONNECTION = 0 STAT_CONNECTION = 1  USB_PORT_STAT_ENABLE 1
hub_port_reset: resetting port 0...
STAT_C_CONNECTION = 0 STAT_CONNECTION = 1  USB_PORT_STAT_ENABLE 1
port 1 connection change
hub_port_reset: resetting port 0...
STAT_C_CONNECTION = 0 STAT_CONNECTION = 1  USB_PORT_STAT_ENABLE 1
hub_port_reset: resetting port 0...
STAT_C_CONNECTION = 0 STAT_CONNECTION = 1  USB_PORT_STAT_ENABLE 1
3 USB Device(s) found
USB1:  USB EHCI 1.00
scanning bus 1 for devices... 1 USB Device(s) found
    scanning usb for storage devices... 1 Storage Device(s) found
Located issu/packages.conf
```

```
Image size 8034 inode num 32464, bks cnt 2 blk size 8*512
#
Located issu/asr900rsp3-rpboot.16.12.01prd15.SPA.pkg
Image size 35163995 inode num 32461, bks cnt 8585 blk size 8*512
```

```
=====
Boot image size = 35163995 (0x2188f5b) bytes
```

```
Package header rev 3 structure detected
```

```
Calculating SHA-1 hash...done
```

```
validate_package_cs: SHA-1 hash:
```

```
  calculated 1910f63e:c01a63ee:18d0e6d1:ebf6233c:e445a270
```

```
  expected   1910f63e:c01a63ee:18d0e6d1:ebf6233c:e445a270
```

```
No suitable keys found in the key storage. 22
```

```
RSA Signed RELEASE Image Signature Verification Successful.
```

```
Image validated
```

```
Passing control to the main image..
```

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```
All TCP AO KDF Tests Pass
cisco ASR-903 (RSP3_200) processor (revision RSP3_200) with 1948285K/6147K bytes of memory.
Processor board ID FOX1606P060
32768K bytes of non-volatile configuration memory.
8388608K bytes of physical memory.
5703875K bytes of eMMC flash at bootflash:.
```

Authentication passed

Example: Single Command Software Upgrade

```
Router# request platform software package install node file bootflash:XE371_k9_0810.bin
interface-module-delay 150
```

```
NOTE: Currently node has booted from a provisioning file
NOTE: Going to start a dual rp sub-packages node ISSU install
--- Starting initial file path checking ---
Copying bootflash:XE371_k9_0810.bin to stby-bootflash:XE371_k9_0810.bin
Finished initial file path checking
--- Starting config-register verification ---
Finished config-register verification
--- Starting image file expansion ---
Expanding image file: bootflash:XE371_k9_0810.bin
Image file expanded and copied
Expanding image file: stby-bootflash:XE371_k9_0810.bin
Image file expanded and copied
Finished image file expansion
STAGE 1: Installing software on standby RP
=====
--- Starting local lock acquisition on R0 ---
Finished local lock acquisition on R0
--- Starting installation state synchronization ---
Finished installation state synchronization
--- Starting local lock acquisition on R1 ---
Finished local lock acquisition on R1
--- Starting file path checking ---
Finished file path checking
--- Starting image file verification ---
Checking image file names
Locating image files and validating name syntax
Found asr903rspl-espbase.BLD_V152_4_S_XE37_THROTTLE_LATEST_20120810_070021.pkg
Found asr903rspl-rpaccess.BLD_V152_4_S_XE37_THROTTLE_LATEST_20120810_070021.pkg
Found asr903rspl-rpbase.BLD_V152_4_S_XE37_THROTTLE_LATEST_20120810_070021.pkg
Found asr903rspl-rpcontrol.BLD_V152_4_S_XE37_THROTTLE_LATEST_20120810_070021.pkg
```

Example: Single Command Software Upgrade

```

Found asr903rsp1-rpios-universalk9_npe.BLD_V152_4_S_XE37_THROTTLE_LATEST_20120810_070021.pkg

Found asr903rsp1-sipbase.BLD_V152_4_S_XE37_THROTTLE_LATEST_20120810_070021.pkg
Found asr903rsp1-sipspa.BLD_V152_4_S_XE37_THROTTLE_LATEST_20120810_070021.pkg
Verifying image file locations
Inspecting image file types
  WARNING: In-service installation of IOSD package
  WARNING: requires software redundancy on target RP
  WARNING: or on-reboot parameter
  WARNING: Automatically setting the on-reboot flag
  WARNING: In-service installation of RP Base package
  WARNING: requires software reboot of target RP
Processing image file constraints
Creating candidate provisioning file
Finished image file verification
--- Starting candidate package set construction ---
Verifying existing software set
Processing candidate provisioning file
Constructing working set for candidate package set
Constructing working set for running package set
Checking command output
Constructing merge of running and candidate packages
Checking if resulting candidate package set would be complete
Finished candidate package set construction
--- Starting compatibility testing ---
Determining whether candidate package set is compatible
Determining whether installation is valid
Determining whether installation is valid ... skipped
Verifying image type compatibility
Checking IPC compatibility for candidate software
Checking candidate package set infrastructure compatibility
Checking infrastructure compatibility with running software
Checking infrastructure compatibility with running software ... skipped
Checking package specific compatibility
Finished compatibility testing
--- Starting list of software package changes ---
Old files list:
  Removed asr903rsp1-espbase.2012-08-12_15.26_amprajap.pkg
  Removed asr903rsp1-rpaccess.2012-08-12_15.26_amprajap.pkg
  Removed asr903rsp1-rpbase.2012-08-12_15.26_amprajap.pkg
  Removed asr903rsp1-rpcontrol.2012-08-12_15.26_amprajap.pkg
  Removed asr903rsp1-rpios-universalk9_npe.2012-08-12_15.26_amprajap.pkg
  Removed asr903rsp1-sipbase.2012-08-12_15.26_amprajap.pkg
  Removed asr903rsp1-sipspa.2012-08-12_15.26_amprajap.pkg
New files list:
  Added asr903rsp1-espbase.BLD_V152_4_S_XE37_THROTTLE_LATEST_20120810_070021.pkg
  Added asr903rsp1-rpaccess.BLD_V152_4_S_XE37_THROTTLE_LATEST_20120810_070021.pkg
  Added asr903rsp1-rpbase.BLD_V152_4_S_XE37_THROTTLE_LATEST_20120810_070021.pkg
  Added asr903rsp1-rpcontrol.BLD_V152_4_S_XE37_THROTTLE_LATEST_20120810_070021.pkg
  Added asr903rsp1-rpios-universalk9_npe.BLD_V152_4_S_XE37_THROTTLE_LATEST_20120810_070021.pkg

  Added asr903rsp1-sipbase.BLD_V152_4_S_XE37_THROTTLE_LATEST_20120810_070021.pkg
  Added asr903rsp1-sipspa.BLD_V152_4_S_XE37_THROTTLE_LATEST_20120810_070021.pkg
Finished list of software package changes
--- Starting commit of software changes ---
Updating provisioning rollback files
Creating pending provisioning file
Committing provisioning file
Finished commit of software changes
SUCCESS: Software provisioned.  New software will load on reboot.
STAGE 2: Restarting standby RP
=====
--- Starting standby reload ---
Finished standby reload

```

```
--- Starting wait for Standby RP to reach terminal redundancy state ---
Finished wait for Standby RP to reach terminal redundancy state
STAGE 3: Installing sipspa package on local RP
=====
--- Starting local lock acquisition on R0 ---
Finished local lock acquisition on R0
--- Starting installation state synchronization ---
Finished installation state synchronization
--- Starting file path checking ---
Finished file path checking
--- Starting image file verification ---
Checking image file names
Locating image files and validating name syntax
  Found asr903rspl-sipspa.BLD_V152_4_S_XE37_THROTTLE_LATEST_20120810_070021.pkg
Verifying image file locations
Inspecting image file types
Processing image file constraints
Creating candidate provisioning file
Finished image file verification
--- Starting candidate package set construction ---
Verifying existing software set
Processing candidate provisioning file
Constructing working set for candidate package set
Constructing working set for running package set
Checking command output
Constructing merge of running and candidate packages
Checking if resulting candidate package set would be complete
Finished candidate package set construction
--- Starting compatibility testing ---
Determining whether candidate package set is compatible
WARNING:
WARNING: Candidate software combination not found in compatibility database
WARNING:
Determining whether installation is valid
WARNING:
WARNING: Candidate software combination not found in compatibility database
WARNING:
WARNING:
WARNING: Candidate software combination not found in compatibility database
WARNING:
Software sets are identified as compatible
Verifying image type compatibility
Checking IPC compatibility with running software
Checking candidate package set infrastructure compatibility
Checking infrastructure compatibility with running software
Checking package specific compatibility
Finished compatibility testing
--- Starting impact testing ---
Checking operational impact of change
Finished impact testing
--- Starting list of software package changes ---
Old files list:
  Removed asr903rspl-sipspa.2012-08-12_15.26_amprajap.pkg
New files list:
  Added asr903rspl-sipspa.BLD_V152_4_S_XE37_THROTTLE_LATEST_20120810_070021.pkg
Finished list of software package changes
--- Starting commit of software changes ---
Updating provisioning rollback files
Creating pending provisioning file
Committing provisioning file
Finished commit of software changes
--- Starting analysis of software changes ---
Finished analysis of software changes
--- Starting update running software ---
```

Example: Single Command Software Upgrade

```

Blocking peer synchronization of operating information
Creating the command set placeholder directory
  Finding latest command set
  Finding latest command shortlist lookup file
  Finding latest command shortlist file
  Assembling CLI output libraries
  Assembling CLI input libraries
  Assembling Dynamic configuration files
  Applying interim IPC and database definitions
  Replacing running software
  Replacing CLI software
  Restarting software
  Restarting IM: 0/0
Skipping IM reload for Ethernet IM
  Restarting IM: 0/1
Skipping IM reload for Ethernet IM
  Restarting IM: 0/2
Skipping IM reload for Ethernet IM
  Restarting IM: 0/3
Skipping IM reload for Ethernet IM
  Restarting IM: 0/4
Skipping IM reload for Ethernet IM
  Applying final IPC and database definitions
  Generating software version information
  Notifying running software of updates
  Unblocking peer synchronization of operating information
Unmounting old packages
Cleaning temporary installation files
  Finished update running software

SUCCESS: Finished installing software.
STAGE 4: Installing software on active RP
=====
--- Starting local lock acquisition on R0 ---
Finished local lock acquisition on R0
--- Starting installation state synchronization ---
Finished installation state synchronization
--- Starting file path checking ---
Finished file path checking
--- Starting image file verification ---
Checking image file names
Locating image files and validating name syntax
  Found asr903rsp1-espbase.BLD_V152_4_S_XE37_THROTTLE_LATEST_20120810_070021.pkg
  Found asr903rsp1-rpaccess.BLD_V152_4_S_XE37_THROTTLE_LATEST_20120810_070021.pkg
  Found asr903rsp1-rpbase.BLD_V152_4_S_XE37_THROTTLE_LATEST_20120810_070021.pkg
  Found asr903rsp1-rpcontrol.BLD_V152_4_S_XE37_THROTTLE_LATEST_20120810_070021.pkg
  Found asr903rsp1-rpios-universalk9_npe.BLD_V152_4_S_XE37_THROTTLE_LATEST_20120810_070021.pkg

  Found asr903rsp1-sipbase.BLD_V152_4_S_XE37_THROTTLE_LATEST_20120810_070021.pkg
  Found asr903rsp1-sipspa.BLD_V152_4_S_XE37_THROTTLE_LATEST_20120810_070021.pkg
Verifying image file locations
Inspecting image file types
  WARNING: In-service installation of IOSD package
  WARNING: requires software redundancy on target RP
  WARNING: or on-reboot parameter
  WARNING: Automatically setting the on-reboot flag
  WARNING: In-service installation of RP Base package
  WARNING: requires software reboot of target RP
Processing image file constraints
Creating candidate provisioning file
Finished image file verification
--- Starting candidate package set construction ---
Verifying existing software set
Processing candidate provisioning file

```



```

Constructing working set for candidate package set
Constructing working set for running package set
Checking command output
Constructing merge of running and candidate packages
Checking if resulting candidate package set would be complete
Finished candidate package set construction
--- Starting compatibility testing ---
Determining whether candidate package set is compatible
Determining whether installation is valid
Determining whether installation is valid ... skipped
Verifying image type compatibility
Checking IPC compatibility for candidate software
Checking candidate package set infrastructure compatibility
Checking infrastructure compatibility with running software
Checking infrastructure compatibility with running software ... skipped
Checking package specific compatibility
Finished compatibility testing
--- Starting list of software package changes ---
Old files list:
  Removed asr903rsp1-espbase.2012-08-12_15.26_amprajap.pkg
  Removed asr903rsp1-rpaccess.2012-08-12_15.26_amprajap.pkg
  Removed asr903rsp1-rpbase.2012-08-12_15.26_amprajap.pkg
  Removed asr903rsp1-rpcontrol.2012-08-12_15.26_amprajap.pkg
  Removed asr903rsp1-rpios-universalk9_npe.2012-08-12_15.26_amprajap.pkg
  Removed asr903rsp1-sipbase.2012-08-12_15.26_amprajap.pkg
New files list:
  Added asr903rsp1-espbase.BLD_V152_4_S_XE37_THROTTLE_LATEST_20120810_070021.pkg
  Added asr903rsp1-rpaccess.BLD_V152_4_S_XE37_THROTTLE_LATEST_20120810_070021.pkg
  Added asr903rsp1-rpbase.BLD_V152_4_S_XE37_THROTTLE_LATEST_20120810_070021.pkg
  Added asr903rsp1-rpcontrol.BLD_V152_4_S_XE37_THROTTLE_LATEST_20120810_070021.pkg
  Added asr903rsp1-rpios-universalk9_npe.BLD_V152_4_S_XE37_THROTTLE_LATEST_20120810_070021.pkg
  Added asr903rsp1-sipbase.BLD_V152_4_S_XE37_THROTTLE_LATEST_20120810_070021.pkg
Finished list of software package changes
--- Starting commit of software changes ---
Updating provisioning rollback files
Creating pending provisioning file
Committing provisioning file
Finished commit of software changes
SUCCESS: Software provisioned. New software will load on reboot.
STAGE 5: Restarting active RP (switchover to stdby)
=====
--- Starting active reload ---
Finished active reload
SUCCESS: node ISSU finished successfully.
RUDY-1#
RUDY-1#Aug 24 07:54:41.715 R0/0: %PMAN-5-EXITACTION: Process manager is exiting: reload fru
  action requested
System Bootstrap, Version 15.3(1r)S1, RELEASE SOFTWARE (fc1)
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 2012 by cisco Systems, Inc.
Compiled Tue 26-Jun-12 12:42 by ccai
Current image running: Boot ROM0UEA platform with 3670016 Kbytes of main memory
Located packages.conf
Image size 7519 inode num 38, bks cnt 2 blk size 8*512
#
Located asr903rsp1-rpbase.BLD_V152_4_S_XE37_THROTTLE_LATEST_20120810_070021.pkg
Image size 34216240 inode num 90631, bks cnt 8354 blk size 8*512
#####
#####
#####
#####
#####
Boot image size = 34216240 (0x20a1930) bytes
Package header rev 0 structure detected

```

Example: Single Command Software Upgrade

```

Calculating SHA-1 hash...done
validate_package: SHA-1 hash:
    calculated e7674970:dbc1eb86:325219c7:b3da0e0f:077e5e4d
    expected   e7674970:dbc1eb86:325219c7:b3da0e0f:077e5e4d
Image validated
%IOSXEBOOT-4-BOOT_ACTIVITY_LONG_TIME: (rp/0): load_crash_kernel took: 2 seconds, expected
max time 2 seconds
%IOSXEBOOT-4-DEBUG_CONF: (rp/0): File /bootflash/debug.conf is absent, ignoring
%IOSXEBOOT-4-BOOT_ACTIVITY_LONG_TIME: (rp/0): Chassis initialization took: 26 seconds,
expected max time 10 seconds
%IOSXEBOOT-4-BOOT_ACTIVITY_LONG_TIME: (rp/0): upgrade hw-programmable took: 2 seconds,
expected max time 2 seconds
        Restricted Rights Legend
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        cisco Systems, Inc.
        170 West Tasman Drive
        San Jose, California 95134-1706
Cisco IOS Software, IOS-XE Software (PPC_LINUX_IOSD-UNIVERSALK9_NPE-M),
Experimental Version 15.2(20120810:081250)
[v152_4_s_xe37_throttle-BLD-BLD_V152_4_S_XE37_THROTTLE_LATEST_20120810_070021-ios 131]
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http://www.cisco.com/wwl/export/crypto/tool/stqrg.html
If you require further assistance please contact us by sending email to
export@cisco.com.
cisco ASR-903 (RSP1) processor with 540359K/6147K bytes of memory.
Processor board ID FOX1518P0GP
32768K bytes of non-volatile configuration memory.
3670016K bytes of physical memory.
1328927K bytes of SD flash at bootflash:.
Press RETURN to get started!

```

Fast Booting the RSP3 .bin Image

Table 11: Feature History

Feature Name	Release Information	Feature Description
Fast Booting the RSP3 .bin Image	Cisco IOS XE Amsterdam 17.3.1	A new command platform fastboot is introduced on the RSP3 module. When enabled on the RSP3 module that is pre-booted with .bin image, on the next reboot, the ROMMON boots up with the corresponding packages.conf image. Boot up from the packages.conf image is much faster and thus, the boot time is reduced approximately by six to eight minutes.

Effective with Cisco IOS XE Release 17.3.1, **platform fastboot** command is introduced on the RSP3 module. When enabled on the RSP3 module that is pre-booted with .bin image, on the next reboot, the ROMMON boots up with the corresponding packages.conf image. Boot up from the packages.conf image is much faster and thus, the boot time is reduced approximately by six to eight minutes.

Limitations

- ISSU is not supported.
- ROMMON version 15.6(36r)S or above must be present.
- If the autoboot image name is changed when the **platform fastboot** command is already enabled, the **platform fastboot** command gets disabled.

The following procedure explains how to enable the **platform fastboot** command.

```
Router#enable
Router#configure terminal
Router(conf)#platform fastboot
Router(conf)#end
```

Use the following command to verify that the **platform fastboot** command is enabled.

```
Router#show running-config | i fastboot
platform fastboot
```

Additional References

Related Documents

Related Topic	Document Title
Cisco IOS master command list	Cisco IOS Master Command List , All Releases

Related Topic	Document Title
Cisco IOS High Availability commands	<i>Cisco IOS High Availability Command Reference</i>

Standards

Standard	Title
No new or modified standards are supported, and support for existing standards has not been modified.	--

MIBs

MIB	MIBs Link
No new or modified MIBs are supported, and support for existing MIBs has not been modified. Cisco ASR 900 Series Aggregation Services Routers MIB Specifications Guide	To locate and download MIBs for selected platforms, Cisco IOS releases, and feature sets, use Cisco MIB Locator found at the following URL: http://www.cisco.com/go/mibs Cisco ASR 900 Series Aggregation Services Routers MIB Specifications Guide

RFCs

RFC	Title
No new or modified RFCs are supported, and support for existing RFCs has not been modified.	--

Technical Assistance

Description	Link
The Cisco Support and Documentation website provides online resources to download documentation, software, and tools. Use these resources to install and configure the software and to troubleshoot and resolve technical issues with Cisco products and technologies. Access to most tools on the Cisco Support and Documentation website requires a Cisco.com user ID and password.	http://www.cisco.com/cisco/web/support/index.html