Software Maintenance Upgrade

The Software Maintenance Upgrade (SMU) is a package that can be installed on a system to provide a fix or a security resolution to a released image.

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Restrictions for Software Maintenance Upgrade

- SMU supports patching using install mode only.
- Prior to Cisco IOS XE Bengaluru 17.9.1, SMU installation was supported both in bundle and install modes. From Cisco IOS XE Bengaluru 17.9.1, SMU installation will be supported in install mode only.

Information About Software Maintenance Upgrade

SMU Overview

The SMU is a package that can be installed on a system to provide a fix or a security resolution to a released image. An SMU package is provided on a per release and per component basis.

An SMU provides a significant benefit over classic Cisco IOS software because it allows you to address network issues quickly while reducing the time and scope of the testing required. The Cisco IOS XE platform internally validates SMU compatibility and does not allow you to install noncompatible SMUs.

All the SMUs are integrated into the subsequent Cisco IOS XE software maintenance releases. An SMU is an independent and self-sufficient package and it does not have any prerequisites or dependencies. You can choose which SMUs to install or uninstall in any order.

SMUs are supported only on Extended Maintenance releases and for the full lifecycle of the underlying software release.

Perform these basic steps to install an SMU:

1. Add the SMU to the filesystem.
2. Activate the SMU on the system.
3. Commit the SMU changes so that it is persistent across reloads.

SMU Workflow

The SMU process is initiated with a request to the Cisco Customer Support. Contact your customer support to raise an SMU request.

At release time, the SMU package is posted to the Cisco Software Download page and can be downloaded and installed.

SMU Package

The SMU package contains a small set of files for patching the release along with metadata that describes the contents of the package, and fix for the reported issue that the SMU is requested for. The SMU package also supports patching of the public key infrastructure (PKI) component.

SMU Reload

The SMU type describes the effect the installed SMU has on the corresponding system. SMUs might not have an impact on traffic, or might result in device restart, reload, or switchover. Run the **show install package flash**: *filename* command to verify whether a reload is required or not.

Hot patching enables SMU to take effect after activation without the system having to be reloaded. After the SMU is committed, the changes are persistent across reloads. In certain cases, SMUs may require a cold (complete) reload of the operating system. This action affects the traffic flow for the duration of the reload. If a cold reload is required, users will be prompted to confirm the action.

Note If the user deletes the SMU file from the directory and performs a bootup, the device displays the error message **`%BOOT-3-BOOTTIME_SMU_MISSING_DETECTED: R0/0: install_engine: SMU file /bootflash/cat9k_iosxe-lni.BLD_POLARIS_DEV_LATEST_20210616_160027.SSA.bin missing and system impact will be unknown`**. However, this will not lead to any functional error.

How to Manage Software Maintenance Updates

The following sections provide information about managing SMUs.

You can install, activate, and commit an SMU package using a single command (1-step process) or using separate commands (3-step process).

Tip Use the 1-step process when you have to install just one SMU package file and use the 3-step process when you have to install multiple SMUs. The 3-step process minimises the number of reloads required when you have more than one SMU package file to install.

Installing an SMU Package: 1-Step Process

This task shows how to use the single **install add file activate commit** command for installing an SMU package.

Before you begin

Check that the SMU you are about to install corresponds to the software image installed on your device. For example, SMU `cat9k_lite_iosxe.16.09.04.CSCvk70181.SPA.smu.bin` is compatible with software image `cat9k_lite_iosxe.16.09.04.SPA.bin`.

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. Enter your password, if prompted.
Step 2	**install add file flash:** *filename* [**activate commit**] **Example:** `Device# install add file flash:cat9k_lite_iosxe.16.09.04.CSCvk70181.SPA.smu.bin activate commit`	Copies the maintenance update package from flash to the device, performs a compatibility check for the platform and image versions, activates the SMU package, and makes the package persistent across reloads. This command extracts the individual components of the .bin file into the subpackages and packages.conf files. You can also copy the SMU package from from a remote location (through FTP, HTTP, HTTPS, or TFTP). **Note** If the SMU file is copied using TFTP, use bootflash to activate the SMU.
Step 3	**exit** **Example:** `Device# exit`	Exits privileged EXEC mode and returns to user EXEC mode.

Installing an SMU Package: 3-Step Process

This task shows you the 3-step process for installing an SMU package. Use this method to install multiple SMUs and avoid multiple reloads.

Before you begin

Check that the SMU you are about to install corresponds to the software image installed on your device. For example, SMU `cat9k_lite_iosxe.16.09.04.CSCvk70181.SPA.smu.bin` is compatible with software image `cat9k_lite_iosxe.16.09.04.SPA.bin`.

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. Enter your password if prompted.

Step 2	**install add file** *location filename*
	Example:
	`Device# install add file flash:cat9k_lite_iosxe.16.12.03.CSCvt22238.SPA.smu.bin`
	`Device# install add file flash:cat9k_lite_iosxe.16.12.03.CSCvt72427.SPA.smu.bin`
		Copies the maintenance update package from flash to the device, and then performs a compatibility check for the platform and image versions, and adds the SMU package on all member nodes or FRUs, as applicable. This command also runs base compatibility checks on a file to ensure that the SMU package is supported on the platform. It also adds an entry in the package/SMU.sta file, so that its status can be monitored and maintained.
		You can also copy the SMU package from a remote location (through FTP, HTTP, HTTPS, or TFTP).

Step 3	**install activate file** *location filename* **Example:** `Device# install activate file flash:cat9k_lite_iosxe.16.12.03.CSCvt22238.SPA.smu.bin, cat9k_lite_iosxe.16.12.03.CSCvt72427.SPA.smu.bin`	Activates the SMU package file that was added and updates the package status details. You will be promped to reload the system in order to complete the activation process. When entering multiple SMUs, use a comma (without a space before or after), to separate file names. Also ensure that total number of characters does not exceed 128. This step involves a reload.
Step 4	**install commit** **Example:** `Device# install commit`	Commits the activation changes to be persistent across reloads. The commit can be done after activation while the system is up, or after the first reload. If a package is activated but not committed, it remains active after the first reload, but not after the second reload.

Managing an SMU

This task shows how to rollback the installation state, deactivate, and remove a previously installed SMU package from the device. This can be used for a SMU that has been installed with the 1-step and 3-step process.

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. Enter your password if prompted.
Step 2	**install rollback to** {**base** | **committed** | **id** *commit-ID*} **Example:** `Device# install rollback to committed`	Returns the device to the previous installation state. After the rollback, a reload is required.
Step 3	**install deactivate file** *location filename* **Example:** `Device# install deactivate file flash:cat9k_lite_iosxe.16.09.04.CSCvk70181.SPA.smu.bin`	Deactivates an active package, updates the package status, and triggers a process to restart or reload.
Step 4	**install remove** {**file** *location filename* | **inactive**} **Example:** `Device# install remove file flash:cat9k_lite_iosxe.16.09.04.CSCvk70181.SPA.smu.bin`	Checks if the specified SMU is inactive and if it is, deletes it from the file system. The **inactive** option deletes all the inactive packages from the file system.
Step 5	**show version** **Example:** `Device# show version`	Displays the image version on the device.
Step 6	**show install summary** **Example:** `Device# show install summary`	Displays information about the active package. The output of this command varies according to the **install** commands that are configured.

Configuration Examples for Software Maintenance Upgrade

The following is a list of SMU configuration examples.

Example: Managing an SMU

Note
- The examples used in this section are of hot patching SMU.

The following example shows how to copy an SMU file to flash:

```
Device# copy ftp://172.16.0.10//auto/ftpboot/user/
cat9k_iosxe.BLD_SMU_20180302_085005_TWIG_LATEST_20180306_013805.3.SSA.smu.bin

flash:
Destination filename
[cat9k_iosxe.BLD_SMU_20180302_085005_TWIG_LATEST_20180306_013805.3.SSA.smu.bin]?
Accessing ftp://172.16.0.10//auto/ftpboot/folder1/
cat9k_iosxe.BLD_SMU_20180302_085005_TWIG_LATEST_20180306_013805.3.SSA.smu.bin...
Loading /auto/ftpboot/folder1/
cat9k_iosxe.BLD_SMU_20180302_085005_TWIG_LATEST_20180306_013805.3.SSA.smu.bin from
172.16.0.10 (via GigabitEthernet0): !
[OK - 17668 bytes]
17668 bytes copied in 0.058 secs (304621 bytes/sec)
```

The following example shows how to add a maintenance update package file:

```
Device# install add file
flash:cat9k_iosxe.BLD_SMU_20180302_085005_TWIG_LATEST_20180306_013805.3.SSA.smu.bin

install_add: START Mon Mar  5 21:48:51 PST 2018
install_add: Adding SMU

--- Starting initial file syncing ---
Info: Finished copying
flash:cat9k_iosxe.BLD_SMU_20180302_085005_TWIG_LATEST_20180306_013805.3.SSA.smu.bin to the
 selected switch(es)
Finished initial file syncing

Executing pre scripts....

Executing pre scripts done.
--- Starting SMU Add operation ---
Performing SMU_ADD on all members
  [1] SMU_ADD package(s) on switch 1
  [1] Finished SMU_ADD on switch 1
Checking status of SMU_ADD on [1]
SMU_ADD: Passed on [1]
Finished SMU Add operation

SUCCESS: install_add
/flash/cat9k_iosxe.BLD_SMU_20180302_085005_TWIG_LATEST_20180306_013805.3.SSA.smu.bin Mon
Mar  5 21:49:00 PST 2018
```

The following is a sample output from the **show install summary** command after adding an SMU package file to the device:

```
Device# show install summary

[ Switch 1 ] Installed Package(s) Information:
State (St): I - Inactive, U - Activated & Uncommitted,
            C - Activated & Committed, D - Deactivated & Uncommitted
```

```
--------------------------------------------------------------------------------
Type  St   Filename/Version
--------------------------------------------------------------------------------
SMU   I    flash:cat9k_iosxe.BLD_SMU_20180302_085005_TWIG_LATEST_20180306_013805.3.SSA.smu.bin
IMG   C    16.9.1.0.43131

--------------------------------------------------------------------------------
Auto abort timer: inactive
--------------------------------------------------------------------------------
```

The following example shows how to activate an added SMU package file:

```
Device# install activate file
flash:cat9k_iosxe.BLD_SMU_20180302_085005_TWIG_LATEST_20180306_013805.3.SSA.smu.bin

install_activate: START Mon Mar  5 21:49:22 PST 2018
install_activate: Activating SMU
Executing pre scripts....

Executing pre scripts done.

--- Starting SMU Activate operation ---
Performing SMU_ACTIVATE on all members
  [1] SMU_ACTIVATE package(s) on switch 1
  [1] Finished SMU_ACTIVATE on switch 1
Checking status of SMU_ACTIVATE on [1]
SMU_ACTIVATE: Passed on [1]
Finished SMU Activate operation

SUCCESS: install_activate
/flash/cat9k_iosxe.BLD_SMU_20180302_085005_TWIG_LATEST_20180306_013805.3.SSA.smu.bin Mon
Mar  5 21:49:34 PST 2018
```

The following a sample output from the **show version** command:

```
Device# show version

Cisco IOS XE Software, Version BLD_POLARIS_DEV_LATEST_20180302_085005_2 - SMU-PATCHED
Cisco IOS Software [Fuji], Catalyst L3 Switch Software (CAT9K_IOSXE), Experimental Version
 16.9.20180302:
085957 [polaris_dev-/nobackup/mcpre/BLD-BLD_POLARIS_DEV_LATEST_20180302_085005 166]
Copyright (c) 1986-2018 by Cisco Systems, Inc.
Compiled Fri 02-Mar-18 09:50 by mcpre
...
```

The following is a sample output from the **show install summary** command displays the status of the SMU package as active and uncommitted:

```
Device# show install summary

[ Switch 1 ] Installed Package(s) Information:
State (St): I - Inactive, U - Activated & Uncommitted,
            C - Activated & Committed, D - Deactivated & Uncommitted
--------------------------------------------------------------------------------
Type  St   Filename/Version
--------------------------------------------------------------------------------
SMU   U    flash:cat9k_iosxe.BLD_SMU_20180302_085005_TWIG_LATEST_20180306_013805.3.SSA.smu.bin
IMG   C    16.9.1.0.43131

--------------------------------------------------------------------------------
Auto abort timer: active on install_activate, time before rollback - 01:59:50
```

```
--------------------------------------------------------------------------------
```

The following is a sample output from the **show install active** command:

```
Device# show install active

[ Switch 1 ] Active Package(s) Information:
State (St): I - Inactive, U - Activated & Uncommitted,
            C - Activated & Committed, D - Deactivated & Uncommitted
--------------------------------------------------------------------------------
Type  St   Filename/Version
--------------------------------------------------------------------------------
SMU   U    flash:cat9k_iosxe.BLD_SMU_20180302_085005_TWIG_LATEST_20180306_013805.3.SSA.smu.bin
IMG   C    16.9.1.0.43131
```

The following example shows how to execute the **install commit** command:

```
Device# install commit

install_commit: START Mon Mar  5 21:50:52 PST 2018
install_commit: Committing SMU
Executing pre scripts....

Executing pre scripts done.
--- Starting SMU Commit operation ---
Performing SMU_COMMIT on all members
  [1] SMU_COMMIT package(s) on switch 1
  [1] Finished SMU_COMMIT on switch 1
Checking status of SMU_COMMIT on [1]
SMU_COMMIT: Passed on [1]
Finished SMU Commit operation

SUCCESS: install_commit
/flash/cat9k_iosxe.BLD_SMU_20180302_085005_TWIG_LATEST_20180306_013805.3.SSA.smu.bin Mon
Mar  5 21:51:01 PST 2018
```

The following is a sample output from the **show install summary** command displays that the update package is now committed, and that it will be persistent across reloads:

```
Device# show install summary

[ Switch 1 ] Installed Package(s) Information:
State (St): I - Inactive, U - Activated & Uncommitted,
            C - Activated & Committed, D - Deactivated & Uncommitted
--------------------------------------------------------------------------------
Type  St   Filename/Version
--------------------------------------------------------------------------------
SMU   C    flash:cat9k_iosxe.BLD_SMU_20180302_085005_TWIG_LATEST_20180306_013805.3.SSA.smu.bin
IMG   C    16.9.1.0.43131

--------------------------------------------------------------------------------
Auto abort timer: inactive
--------------------------------------------------------------------------------
```

The following example shows how to rollback an update package to the committed package:

```
Device# install rollback to committed

install_rollback: START Mon Mar  5 21:52:18 PST 2018
install_rollback: Rolling back SMU
Executing pre scripts....
```

```
Executing pre scripts done.

--- Starting SMU Rollback operation ---
Performing SMU_ROLLBACK on all members
  [1] SMU_ROLLBACK package(s) on switch 1
  [1] Finished SMU_ROLLBACK on switch 1
Checking status of SMU_ROLLBACK on [1]
SMU_ROLLBACK: Passed on [1]
Finished SMU Rollback operation

SUCCESS: install_rollback
/flash/cat9k_iosxe.BLD_SMU_20180302_085005_TWIG_LATEST_20180306_013805.3.SSA.smu.bin Mon
Mar  5 21:52:30 PST 2018
```

The following is a sample output from the **show install summary** command:

```
Device# show install summary

[ Switch 1 ] Installed Package(s) Information:
State (St): I - Inactive, U - Activated & Uncommitted,
            C - Activated & Committed, D - Deactivated & Uncommitted
--------------------------------------------------------------------------------
Type  St   Filename/Version
--------------------------------------------------------------------------------
IMG   C    16.9.1.0.43131

--------------------------------------------------------------------------------
Auto abort timer: inactive
--------------------------------------------------------------------------------
```

The following example shows how to deactivate an SMU package file:

```
Device# install deactivate file
flash:cat9k_iosxe.BLD_SMU_20180302_085005_TWIG_LATEST_20180306_013805.3.SSA.smu.bin

install_deactivate: START Mon Mar  5 21:54:06 PST 2018
install_deactivate: Deactivating SMU
Executing pre scripts....

Executing pre scripts done.

--- Starting SMU Deactivate operation ---
Performing SMU_DEACTIVATE on all members
  [1] SMU_DEACTIVATE package(s) on switch 1
  [1] Finished SMU_DEACTIVATE on switch 1
Checking status of SMU_DEACTIVATE on [1]
SMU_DEACTIVATE: Passed on [1]
Finished SMU Deactivate operation

SUCCESS: install_deactivate
/flash/cat9k_iosxe.BLD_SMU_20180302_085005_TWIG_LATEST_20180306_013805.3.SSA.smu.bin Mon
Mar  5 21:54:17 PST 2018
```

The following is a sample output from the **show install summary** command:

```
Device# show install summary

[ Switch 1 ] Installed Package(s) Information:
State (St): I - Inactive, U - Activated & Uncommitted,
            C - Activated & Committed, D - Deactivated & Uncommitted
--------------------------------------------------------------------------------
Type  St   Filename/Version
--------------------------------------------------------------------------------
```

```
SMU   D    flash:cat9k_iosxe.BLD_SMU_20180302_085005_TWIG_LATEST_20180306_013805.3.SSA.smu.bin
IMG   C    16.9.1.0.43131

--------------------------------------------------------------------------------
Auto abort timer: active on install_deactivate, time before rollback - 01:59:50
--------------------------------------------------------------------------------
```

The following example shows how to remove an SMU from the device:

```
Device# install remove file
flash:cat9k_iosxe.BLD_SMU_20180302_085005_TWIG_LATEST_20180306_013805.3.SSA.smu.bin

install_remove: START Mon Mar  5 22:03:50 PST 2018
install_remove: Removing SMU
Executing pre scripts....

Executing pre scripts done.

--- Starting SMU Remove operation ---
Performing SMU_REMOVE on all members
  [1] SMU_REMOVE package(s) on switch 1
  [1] Finished SMU_REMOVE on switch 1
Checking status of SMU_REMOVE on [1]
SMU_REMOVE: Passed on [1]
Finished SMU Remove operation

SUCCESS: install_remove
/flash/cat9k_iosxe.BLD_SMU_20180302_085005_TWIG_LATEST_20180306_013805.3.SSA.smu.bin Mon
Mar  5 22:03:58 PST 2018
```

The following is a sample output from the **show install summary** command:

```
Device# show install summary

[ Switch 1 ] Installed Package(s) Information:
State (St): I - Inactive, U - Activated & Uncommitted,
            C - Activated & Committed, D - Deactivated & Uncommitted
--------------------------------------------------------------------------------
Type  St   Filename/Version
--------------------------------------------------------------------------------
IMG   C    16.9.1.0.43131

--------------------------------------------------------------------------------
Auto abort timer: inactive
--------------------------------------------------------------------------------
```

Additional References for Software Maintenance Upgrade

Related Documents

Related Topic	Document Title
For complete syntax and usage information for the commands used in this chapter.	*Command Reference (Catalyst 9500 Series Switches)*

Feature History for Software Maintenance Upgrade

This table provides release and related information for features explained in this module.

These features are available on all releases subsequent to the one they were introduced in, unless noted otherwise.

Release	Feature	Feature Information
Cisco IOS XE Everest 16.6.1	Software Maintenance Upgrade (SMU)	An SMU is a package that can be installed on a system to provide a fix or a security resolution to a released image. Support for this feature was introduced on the C9500-12Q, C9500-16X, C9500-24Q, C9500-40X models of the Cisco Catalyst 9500 Series Switches.
Cisco IOS XE Fuji 16.9.1	Software Maintenance Upgrade (SMU)	Support for this feature was introduced on the C9500-32C, C9500-32QC, C9500-48Y4C, and C9500-24Y4C models of Cisco Catalyst 9500 Series Switches.
	Hot patching	Hot patching enables SMU to take effect after activation without the system having to be reloaded. Support for hot patching was introduced on all models of Cisco Catalyst 9500 Series Switches.
Cisco IOS XE Gibraltar 16.10.1	Public Key Infrastructure (PKI) Patching	The SMU package supports patching of the PKI component. Support for this enhancement was introduced on all models of Cisco Catalyst 9500 Series Switches.
Cisco IOS XE Cupertino 17.7.1	Software Maintenance Upgrade (SMU)	Support for this feature was introduced on the C9500X-28C8D model of the Cisco Catalyst 9500 Series Switches.
Cisco IOS XE Cupertino 17.9.1	Software Maintenance Upgrade (SMU)	SMU installation is supported in install mode only.

Use Cisco Feature Navigator to find information about platform and software image support. To access Cisco Feature Navigator, go to http://www.cisco.com/go/cfn.