在 Catalyst 3850 和 Catalyst 9000 系列交换机上执行 ISSU

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简介

本文档介绍在 Catalyst 3850 和 Catalyst 9000 系列交换机上执行服务中软件升级 (ISSU) 所涉及的步骤。

什么是ISSU

服务中软件升级是在网络继续转发数据包时将映像升级为设备上的另一个映像的过程。ISSU可帮助网络管理员在执行软件升级时避免网络中断。所述映像以安装模式升级，其中，每个软件包被单独升级。

支持Stackwise-Virtual的所有Catalyst 3850和Catalyst 9000系列上均支持ISSU，带双管理引擎的Catalyst 9400/9600独立机箱上也支持ISSU。

StackWise虚拟(SVL)包括两个连接在一起的交换机，形成一个虚拟交换机。SVL支持服务中软件升级。

支持的平台和版本支持列表

在继续ISSU之前，请检查平台是否实际支持ISSU。此外，验证当前代码和目标代码之间是否支持ISSU。有关支持的平台和ISSU兼容性矩阵的模式详细信息，请访问以下网址：

不同版本间的ISSU支持

ISSU之前的先决条件

注意：本文档中的示例基于配置为Stackwise-Virtual的Cisco Catalyst 9500交换机。这些步骤适用于具有双管理引擎的Cat9400/Cat9600独立机箱，也适用于配置为Stackwise-Virtual的Catalyst 3850/Catalyst 9000设备。
为了避免在此过程中丢失任何数据包，ISSU需要在节点中对主用和备用设备进行冗余。因为发生重新加载，需要在这些重新加载和加载之间切换，以确保网络具有高可用性。

1.检查当前代码版本

<#root>

```
C9500#show version | in IOS XE

Cisco IOS XE Software, Version 16.09.02
```

2.检查引导模式

只有在Stackwise虚拟中的两台交换机均在Install（安装）模式下启动时，才支持ISSU。

<#root>

```
C9500#show ver | in INSTALL

*    1 50    C9500-40X          16.9.2            CAT9K_IOSXE           INSTALL
     2 50    C9500-40X          16.9.2            CAT9K_IOSXE           INSTALL

On Catalyst 9400, the above output is not available. Check if the switch booted from packages.conf file

C9400#show version | in System image
System image file is "flash:packages.conf"
```

如果以捆绑包模式引导机箱，则不支持ISSU。如果在捆绑包模式下运行交换机时尝试运行ISSU，您会看到这样的错误。

<#root>

```
*Nov 13 14:55:57.338: %INSTALL-5-INSTALL_START_INFO: Chassis 1 R1/0: install_engine: Started install on
ERROR: install_add_activate_commit: One-Shot ISSU operation is

not supported in bundle boot mode

FAILED: install_add_activate_commit  exit(1) Tue Nov 13 14:56:03 UTC 2018
```

3.检查闪存上是否有足够的可用内存

<#root>

```
C9500#dir flash: | in free


11353194496 bytes total (8565174272 bytes free)


C9500#dir stby-flash: | in free


11353980928 bytes total (8566865920 bytes free)
```

确保闪存中至少有1GB的空间来扩展新映像。清理旧的安装文件，以防空间不足，然后使用install remove inactive命令。

4.检查交换机是否处于SSO模式

<#root>

```
C9500#show redundancy


Redundant System Information :
------------------------------
       Available system uptime = 4 minutes
Switchovers system experienced = 0
              Standby failures = 0
        Last switchover reason = none

                 Hardware Mode = Duplex


Configured Redundancy Mode = sso


     Operating Redundancy Mode = sso


               Maintenance Mode = Disabled
                 Communications = Up

Current Processor Information :
```

```
------------------------------
               Active Location = slot 1
        Current Software state = ACTIVE
       Uptime in current state = 30 minutes
                 Image Version = Cisco IOS Software [Fuji], Catalyst L3 Switch Software (CAT9K_IOSXE), V
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 1986-2018 by Cisco Systems, Inc.
Compiled Mon 05-Nov-18 19:32 by mcpre


BOOT = flash:packages.conf;


                  CONFIG_FILE =
        Configuration register = 0x102

Peer Processor Information :
----------------------------
              Standby Location = slot 2
        Current Software state = STANDBY HOT
       Uptime in current state = 26 minutes
                 Image Version = Cisco IOS Software [Fuji], Catalyst L3 Switch Software (CAT9K_IOSXE), V
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 1986-2018 by Cisco Systems, Inc.
Compiled Mon 05-Nov-18 19:32 by mcpre


BOOT = flash:packages.conf;


                  CONFIG_FILE =
        Configuration register = 0x102
```

5.检查是否启用了自动引导

<#root>

```
C9500#show boot system


---------------------------

Switch 1


---------------------------
Current Boot Variables:
BOOT variable = flash:packages.conf;

Boot Variables on next reload:
BOOT variable = flash:packages.conf;

Manual Boot = no                        <<<<< Manual Boot should be set to "no"


Enable Break = no
Boot Mode = DEVICE
```

```
iPXE Timeout = 0
---------------------------
```

Switch 2

```
---------------------------
Current Boot Variables:
BOOT variable = flash:packages.conf;

Boot Variables on next reload:
BOOT variable = flash:packages.conf;
```

Manual Boot = no

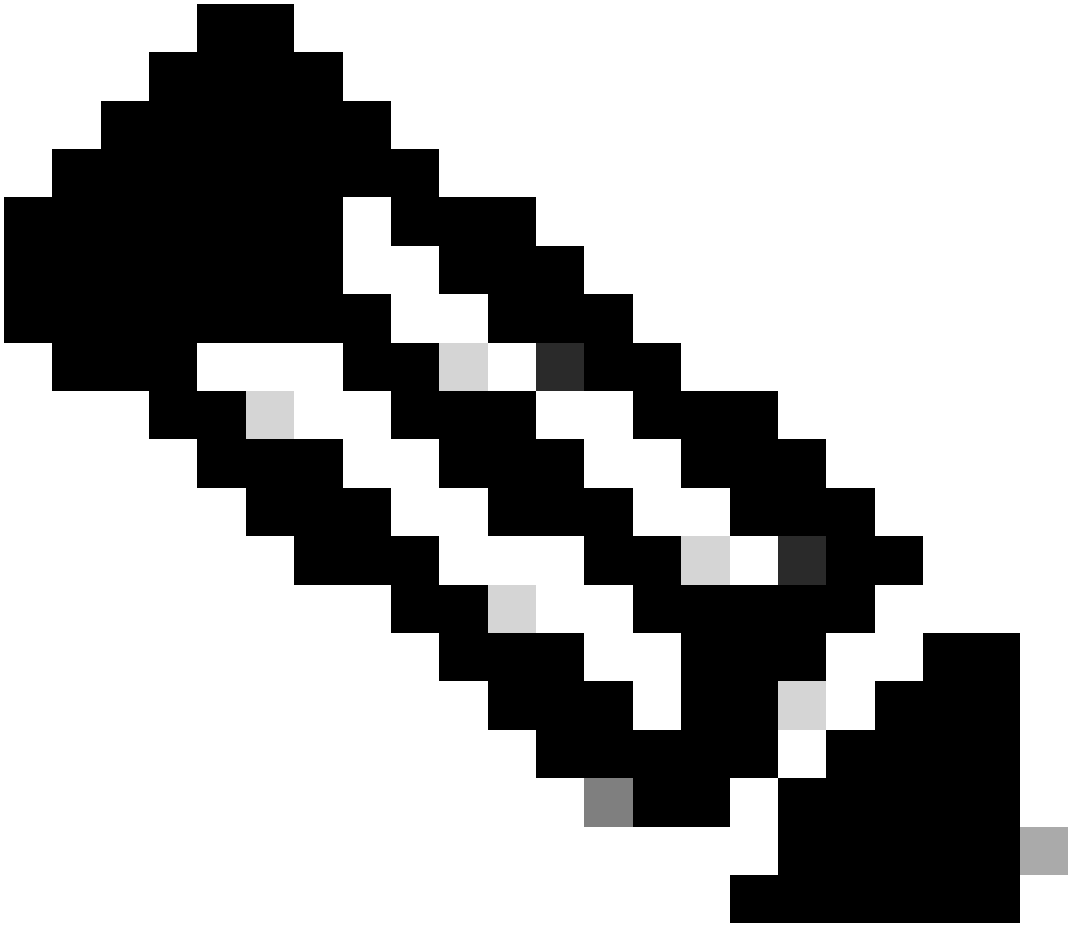
```
Enable Break = no
Boot Mode = DEVICE
iPXE Timeout = 0
```

如果未启用自动启动，则可以按如下所示进行更改：

<#root>

C9500(config)#no boot manual

6.检查当前ISSU和安装状态



注意：此步骤非常重要！

<#root>

C9500#show issu state detail

--- Starting local lock acquisition on switch 1 ---
Finished local lock acquisition on switch 1

No ISSU operation is in progress   <<<<<<<<< If see anything else, abort ISSU before proceeding.

Check on how to manually abort ISSU.

C9500#show install summary

```
[ Switch 1 2 ] Installed Package(s) Information:
State (St): I - Inactive, U - Activated & Uncommitted,
            C - Activated & Committed, D - Deactivated & Uncommitted
--------------------------------------------------------------------------------
Type  St   Filename/Version
--------------------------------------------------------------------------------

IMG   C    16.9.2.0.2433      <<<<<<<< State should be Activated & Committed for current version alone.


 If not clear install state before proceeding. Check on how to clear install state.



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

7.复制要升级/降级的新映像

仅将映像复制到活动机箱（对于Stackwise）或活动管理引擎（对于Cat9400双SUP）就足够了。

<#root>

```
C9500#copy tftp: bootflash:

Address or name of remote host []? X.X.X.X
Source filename []? cat9k_iosxe.16.09.02.SPA.bin
Destination filename [cat9k_iosxe.16.09.02.SPA.bin]?
```

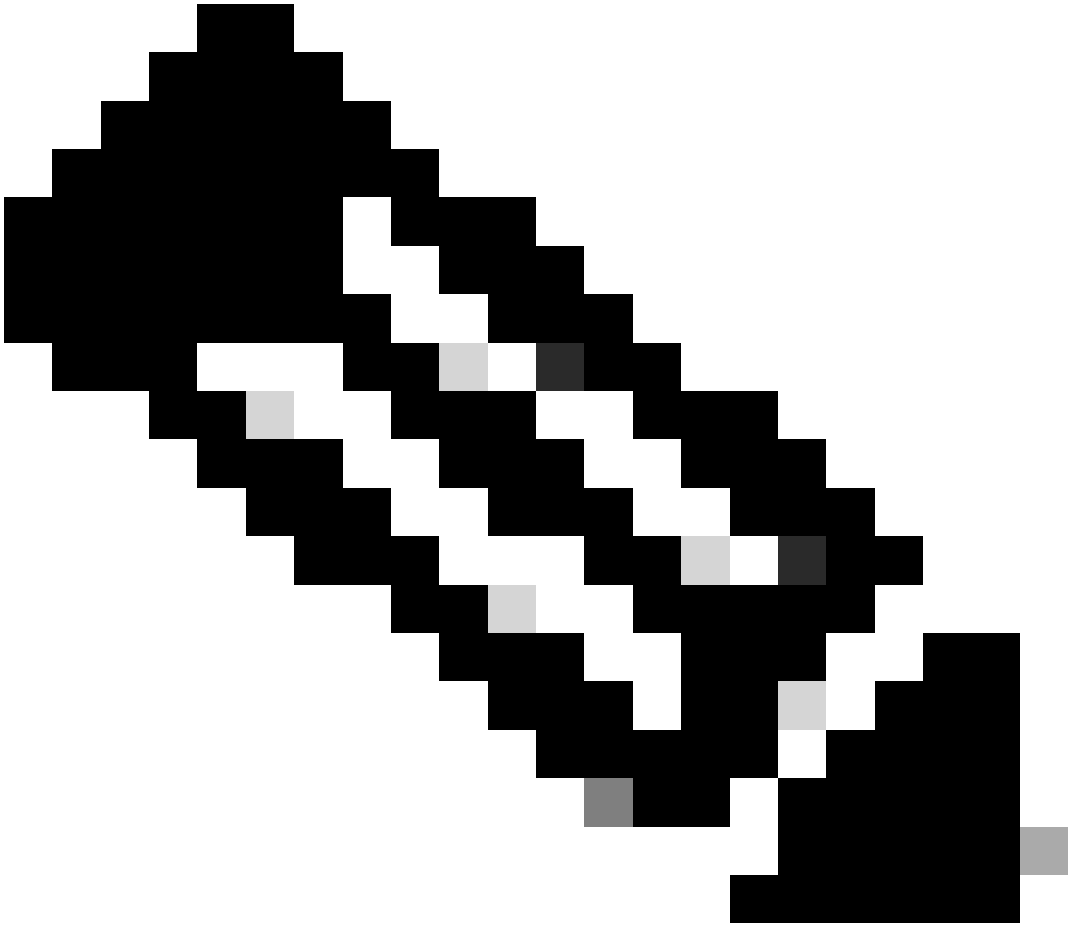
ISSU工作流程 — 实际升级

验证所有前提条件后，您可以继续进行实际升级，并使用下列方法之一：

- 一步工作流（仅一步操作，不支持回滚）
- 三步工作流（涉及3个步骤，支持故障回滚）

一步工作流

此工作流程仅涉及一个步骤，有助于优化。



注意：无法回滚，因为升级已自动提交。如果要回滚，请继续执行3步工作流。

<#root>

// This example has SW-2 as Active and Sw-1 as Standby before starting ISSU

C9500#install add file flash:cat9k_iosxe.16.09.02.SPA.bin activate issu commit

```
install_add_activate_commit: START Fri Feb  8 10:07:51 jst 2019

*Feb  8 10:07:52.456 jst: %INSTALL-5-INSTALL_START_INFO: Switch 2 R0/0: install_engine: Started install

--- Starting initial file syncing ---
[2]: Copying flash:cat9k_iosxe.16.09.02.SPA.bin from switch 2 to switch 1
[1]: Finished copying to switch 1
Info: Finished copying flash:cat9k_iosxe.16.09.02.SPA.bin to the selected switch(es)
Finished initial file syncing

--- Starting Add ---
```

```
Performing Add on all members
  [1] Add package(s) on switch 1
  [1] Finished Add on switch 1
  [2] Add package(s) on switch 2
  [2] Finished Add on switch 2
Checking status of Add on [1 2]
Add: Passed on [1 2]
Finished Add

install_add_activate_commit: Activating ISSU

Going to start Oneshot ISSU install process
```

STAGE 0: Initial System Level Sanity Check before starting ISSU

```
==================================================
--- Verifying install_issu supported ---
--- Verifying standby is in Standby Hot state ---
--- Verifying booted from the valid media ---
--- Verifying AutoBoot mode is enabled ---
Finished Initial System Level Sanity Check
```

STAGE 1: Installing software on Standby

```
==================================================
--- Starting install_remote ---
Performing install_remote on Chassis remote
[1] install_remote package(s) on switch 1
[1] Finished install_remote on switch 1
install_remote: Passed on [1]
Finished install_remote
```

STAGE 2: Restarting Standby

```
==================================================
--- Starting standby reload ---
Finished standby reload

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

<<<<< Standby (Sw-1) reloads here!!!

<<<<<<<< After Standby (Sw-1) comes up >>>>>>>>>>

```
*Feb  8 10:19:10.223 jst: %REDUNDANCY-3-IPC: IOS versions do not match.

*Feb  8 10:19:48.421 jst: %HA_CONFIG_SYNC-6-BULK_CFGSYNC_SUCCEED: Bulk Sync succeeded

*Feb  8 10:19:49.422 jst: %RF-5-RF_TERMINAL_STATE: Terminal state reached for (SSO)   <<<<< Standby (Sw

*Feb  8 10:21:02.975 jst: %PLATFORM-6-HASTATUS_DETAIL: RP switchover, received chassis event became act
```

```
<<<<<<<< After new Standby (Sw-2) comes up >>>>>>>>


*Feb  8 10:27:09.715 jst: %HA_CONFIG_SYNC-6-BULK_CFGSYNC_SUCCEED: Bulk Sync succeeded

*Feb  8 10:27:10.717 jst: %RF-5-RF_TERMINAL_STATE: Terminal state reached for (SSO).

<<<< ISSU commit starts after this automatically..



*Feb  8 10:28:27.302 jst: %INSTALL-5-INSTALL_START_INFO: Switch 2 R0/0: install_engine: Started install

%IOSXEBOOT-4-ISSU_ONE_SHOT: (rp/0): ISSU finished successfully


*Feb  8 10:29:32.127 jst: %INSTALL-5-INSTALL_COMPLETED_INFO: Switch 2 R0/0: install_engine: Completed i
```

在ISSU完成后继续执行。

三步工作流

- 此工作流程包括三个步骤：添加、激活和提交。激活后，所有交换机都将升级到新的软件版本，但软件不会自动提交，而必须通过install commit命令手动执行。
- 此方法的优点是系统可以回滚到以前的软件版本。
- 如果回滚计时器未停止并使用install auto-abort-timer stop或install commit命令，系统会自动回滚。如果回滚计时器停止，新软件版本可以在设备上运行任何持续时间，然后回滚到以前的版本。

步骤1.安装add。

此命令将映像下载到bootflash并在两台交换机上展开映像。

<#root>

```
// This example has SW-1 as Active and Sw-2 as Standby before starting ISSU


C9500#install add file flash:cat9k-universalk9.SPA.16.09.03.BETA.E1.SSA.bin.bin
install_add: START Fri Feb  8 09:22:00 jst 2019

*Feb  8 09:22:02.055 jst: %INSTALL-5-INSTALL_START_INFO: Switch 1 R0/0: install_engine: Started install

--- Starting initial file syncing ---
[1]: Copying flash:cat9k-universalk9.SPA.16.09.03.BETA.E1.SSA.bin.bin from switch 1 to switch 2
[2]: Finished copying to switch 2
Info: Finished copying flash:cat9k-universalk9.SPA.16.09.03.BETA.E1.SSA.bin.bin to the selected switch(
Finished initial file syncing

--- Starting Add ---
```

```
Performing Add on all members
  [1] Add package(s) on switch 1
  [1] Finished Add on switch 1
  [2] Add package(s) on switch 2
  [2] Finished Add on switch 2
Checking status of Add on [1 2]
Add: Passed on [1 2]
Finished Add

SUCCESS: install_add  Fri Feb  8 09:26:26 jst 2019  <<<< Wait until install_add says SUCCESS. If fails,
```

步骤2.安装激活。

- 当您执行此命令时，会发生以下一系列事件：

  (i)启动回滚计时器。如果回滚计时器过期，则系统回滚到ISSU启动前的相同状态。使用install auto-abort-timer stop命令可以停止回滚计时器。使用install abort issu命令时，可以回滚ISSU。

  (ii)备用交换机使用新软件进行调配，然后使用新软件版本重新加载。接下来，为活动交换机调配新软件，并重新加载。具有新映像的备用交换机现在成为活动交换机，而旧的活动交换机成为备用交换机。

在此过程结束时，两台交换机都使用新的软件映像运行。

<#root>

```
C9500#install activate issu

install_activate: START Fri Feb  8 09:28:27 jst 2019
install_activate: Activating ISSU

*Feb  8 09:28:28.905 jst: %INSTALL-5-INSTALL_START_INFO: Switch 1 R0/0: install_engine: Started install
Going to start Activate ISSU install process

STAGE 0: Initial System Level Sanity Check before starting ISSU=========================================
--- Verifying install_issu supported ---
--- Verifying standby is in Standby Hot state ---
--- Verifying booted from the valid media ---
--- Verifying AutoBoot mode is enabled ---
Finished Initial System Level Sanity Check

STAGE 1: Installing software on Standby

================================================
--- Starting install_remote ---
Performing install_remote on Chassis remote

*Feb  8 09:28:31.880 jst: %INSTALL-5-INSTALL_AUTO_ABORT_TIMER_PROGRESS: Switch 1 R0/0: rollback_timer:


[2] install_remote package(s) on switch 2
[2] Finished install_remote on switch 2
install_remote: Passed on [2]
Finished install_remote
```

STAGE 2: Restarting Standby

```
==================================================
--- Starting standby reload ---
Finished standby reload--- Starting wait for Standby to reach terminal redundancy state ---
```

<<<<<<<< Standby (Sw-2) reloads here!!!*Feb 8 09:35:16.489 jst: %REDUNDANCY-3-IPC: IOS versions do not

```
*Feb  8 09:36:00.238 jst: %HA_CONFIG_SYNC-6-BULK_CFGSYNC_SUCCEED: Bulk Sync succeeded
*Feb  8 09:36:01.240 jst: %RF-5-RF_TERMINAL_STATE: Terminal state reached for (SSO)
```

<<<< At this point, Standby (Sw-2) comes up with new code and joins as Hot Standby
Finished wait for Standby to reach terminal redundancy state

STAGE 3: Installing software on Active

```
==================================================
--- Starting install_active ---

Performing install_active on Chassis 11] install_active package(s) on switch 1
[1] Finished install_active on switch 1
install_active: Passed on [1]
Finished install_active
Chassis 1 reloading, reason - Non participant detected
```

STAGE 4: Restarting Active (switchover to standby)   <<<<<<<< At this point, there is a switchover ar

```
==================================================
--- Starting active reload ---
 New software can load after reboot process is completed
SUCCESS: install_activate  Fri Feb  8 09:37:14 jst 2019
```

在Activate状态结束时，检查ISSU状态。

<#root>

C9500#show issu state detail

```
--- Starting local lock acquisition on switch 2 ---
Finished local lock acquisition on switch 2

Operation type: Step-by-step ISSU
Install type  : Image installation using ISSUCurrent state : Activated state
Last operation: Switchover
```

Completed operations:

```
Operation                          Start time
--------------------------------------------------
Activate location standby Chassis 2 2019-02-08:09:28:32
Activate location active Chassis 1  2019-02-08:09:36:03
Switchover                         2019-02-08:09:37:16
```

```
State transition: Added -> Standby activated -> Active switched-over
```

```
Auto abort timer: automatic, remaining time before rollback: 01:43:55
Running image: flash:packages.conf
Operating mode: sso, terminal state reached
```

<<<<< Wait until SSO terminal state before proceeding to commit.

步骤3.安装提交。

commit命令执行必要的清理，将新软件作为永久软件启用（删除软件的旧版本），并停止回滚计时器。提交后的任何重新引导都可使用新软件启动。

<#root>

C9500#install commit

```
install_commit: START Fri Feb  8 09:45:22 jst 2019
install_commit: Committing ISSU

*Feb  8 09:45:23.533 jst: %INSTALL-5-INSTALL_START_INFO: Switch 2 R0/0: install_engine: Started install

Going to start Commit ISSU install process

STAGE 0: Initial System Level Sanity Check before starting ISSU
================================================
--- Verifying install_issu supported ---
--- Verifying standby is in Standby Hot state ---
--- Verifying booted from the valid media ---
--- Verifying AutoBoot mode is enabled ---

Finished Initial System Level Sanity Check
```

--- Starting install_commit_2 ---

```
Performing install_commit_2 on Chassis 2
[2] install_commit_2 package(s) on switch 2
[2] Finished install_commit_2 on switch 2
install_commit_2: Passed on [2]
Finished install_commit_2


STAGE 1: Dispatching the commit command to remote
================================================
```

--- Starting install_commit_remote ---

```
Performing install_commit_remote on Chassis 1
Feb  8 09:48:33.364: %INSTALL-5-INSTALL_START_INFO: R0/0: install_engine: Started install commit

*Feb  8 09:48:33.352 jst: %INSTALL-5-INSTALL_START_INFO: Switch 1 R0/0: install_engine: Started install


Feb  8 09:51:27.505: %INSTALL-5-INSTALL_COMPLETED_INFO: R0/0: install_engine: Completed install commit
[1] install_commit_remote package(s) on switch 1
[1] Finished install_commit_remote on switch 1
install_commit_remote: Passed on [1]
Finished install_commit_remote
```

```
SUCCESS: install_commit  Fri Feb  8 09:51:27 jst 2019
```

<<<<< ISSU is completed here!!!!!

ISSU后检查表

ISSU成功完成后，

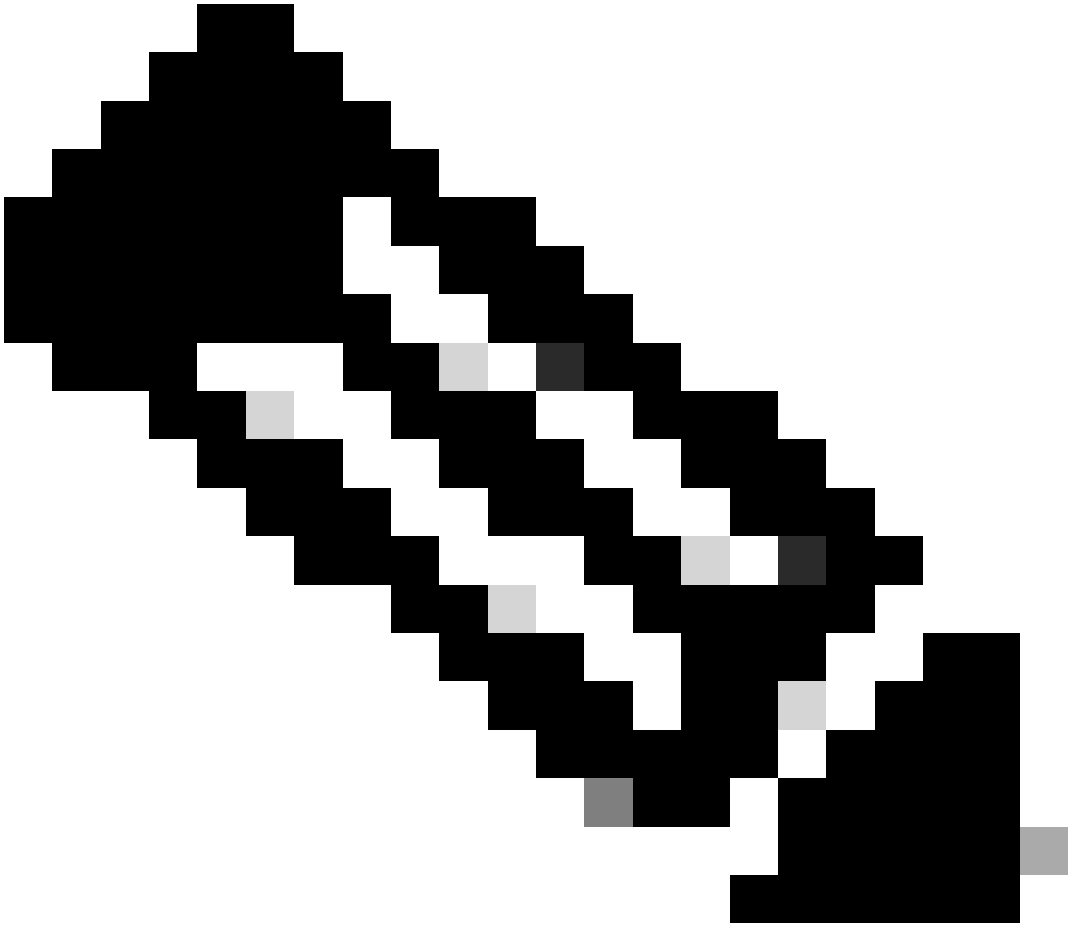
- 检查两台交换机是否都运行在新软件上。
- 选中show issu state detail output to be clean and not showing any ISSU in progress。
- 检查show install issu history输出以确保ISSU操作成功（命令仅适用于16.10.1版本及更高版本）。
- 建议在启用任何新功能之前，在新软件中留出足够的浸泡时间。

ISSU故障时的操作

- 如果ISSU发生故障，则预期自动中止会将系统恢复到初始状态（较旧的映像）。 但是，如果此操作也失败，则需要手动恢复机箱。
- 在手动恢复期间，检查主用和备用是否都运行旧映像（如果不运行，则恢复单个机箱）。
- 确保两个机箱都运行旧映像后，运行install remove inactive以删除任何未使用的映像软件包。
- 一旦两个机箱都运行旧软件，请手动清除ISSU操作的所有内部状态。（有关如何清除内部ISSU状态，请参阅此处）。

中止ISSU

- 在3步工作流程中，在激活ISSU过程中，如果abort-timer过期，系统可以自动中止到较旧的映像。



注意：如果备用设备在中止期间未到达SSO，则需要手动中止。此外，如果由于任何原因您希望在中间中止ISSU，则需要手动中止。

<#root>

EXAMPLE : During install add, we notice these erro

rs:

C9400#install add file flash:cat9k_iosxe.16.09.02.SPA.bin
install_add: START Tue Nov 13 20:47:53 UTC 2018

*Nov 13 20:47:54.787: %INSTALL-5-INSTALL_START_INFO: Chassis 1 R1/0: install_engine: Started install ad

--- Starting initial file syncing ---
[1]: Copying flash:cat9k_iosxe.16.09.02.SPA.bin from chassis 1 to chassis 2
[2]: Finished copying to chassis 2
Info: Finished copying flash:cat9k_iosxe.16.09.02.SPA.bin to the selected chassis
Finished initial file syncing

```
--- Starting Add ---
Performing Add on all members
  [1] Add package(s) on chassis 1
  [1] Finished Add on chassis 1
  [2] Add package(s) on chassis 2
    cp: cannot stat '/tmp/packages.conf': No such file or directory
  [2] Finished Add on chassis 2
Checking status of Add on [1 2]
Add: Passed on [1]. Failed on [2]
Finished Add


FAILED: install_add  exit(1) Tue Nov 13 20:51:58 UTC 2018   <<<<<< install_add failed. If see any such e


C9400#install abort issu


install_abort: START Tue Nov 13 20:57:40 UTC 2018
install_abort: Abort type ISSU subtype NONE smutype NONE

*Nov 13 20:57:41.759: %INSTALL-5-INSTALL_START_INFO: Chassis 1 R1/0: install_engine: Started install ab

NOTE: Going to start Abort ISSU install process

STAGE 0: Initial System Level Sanity Check before starting ISSU
================================================
--- Verifying install_issu supported ---
--- Verifying booted from the valid media ---
--- Verifying AutoBoot mode is enabled ---
Finished Initial System Level Sanity Check

FAILED: ABORT operation is not allowed in ADDED state
ERROR: install_abort  exit(2 ) Tue Nov 13 20:57:49 UTC 2018

*Nov 13 20:57:49.756: %INSTALL-5-INSTALL_COMPLETED_INFO: Chassis 1 R1/0: install_engine:

Completed install abort ISSU
```

正常ISSU状态

如果ISSU升级/降级/中止/自动中止失败，则需要手动清除ISSU内部状态。

<#root>

```
C9400#sh issu state detail

--- Starting local lock acquisition on chassis 1 ---
Finished local lock acquisition on chassis 1

Operation type: One-shot ISSU
Install type  : Image installation using ISSU

Current state : Added state
Last operation: Activate location standby Chassis 2   <<<< Previous Add is still pending. This needs to

Completed operations:

Operation                          Start time
--------------------------------------------------------
```

```
Activate location standby Chassis 2 2018-11-13:16:26:34

State transition: Added

Auto abort timer: inactive
Running image: flash:packages.conf
Operating mode: sso, terminal state not reached
```

Enable Service Internal before you run this command

C9400#clear install state

```
clear_install_state: START Tue Nov 13 17:05:47 UTC 2018
--- Starting clear_install_state ---
Performing clear_install_state on all members
  [1] clear_install_state package(s) on chassis 1
  [1] Finished clear_install_state on chassis 1
Checking status of clear_install_state on [1]
clear_install_state: Passed on [1]
```

Finished clear_install_state

C9400#sh issu state detail

```
--- Starting local lock acquisition on chassis 1 ---
Finished local lock acquisition on chassis 1
```

No ISSU operation is in progress

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