Cisco ASR 9000 Series Aggregation Services Router, Release 4.3.0

Upgrade and Downgrade Procedure

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1. Introduction

1.1 Purpose, Audience and Scope

The purpose of this document is to describe the upgrade and downgrade procedure for the Cisco ASR 9000 Series Aggregation Services Router, Release 4.3.0.

Audience: This guide is for Cisco Systems Field Engineers and Network Operators.

1.2 What is new?

1. In R4.3.0, a single combo image is introduced to support x86 (-px- image) and ppc (-p- image) hardware architectures. The combo image will still be called asr9k-mini-px.vm. The optional pies - mpls, mcast, mgbl, FPD, etc. and SMUs will have the -px- suffix.
2. FPD pie is not included in the combo image, it must be installed separately to complete manual firmware upgrade. Users upgrading from –p- to 4.3.0 –px- image must add fpd pie explicitly to complete the manual firmware upgrade.
3. Turboboot is needed to downgrade from 4.3.0-px to any previous images.
4. BNG pie is needed to activate any bng functionality.
5. Two new nV asr901 and asr903 pies are introduced.

1.3 Summary of Upgrade Steps

1. Download the correct image tarball from http://www.cisco.com to a tftpserver. **The image tarball on http://www.cisco.com cannot be used as-is. The CCO image tarball for Release 4.3.0 must be downloaded to a tftpserver and only relevant packages or SMUs must be taken and tarred into another tarball for use on the router.**

   Install add/activate all the mandatory SMUs required to be active in the current release before upgrading to Release 4.3.0. Refer to the Section "Mandatory SMUs (Upgrade and Downgrade)" for a list of SMUs to be used. The mandatory SMUs are available in the downloaded tar file.

2. Verify if firmware upgrade is needed before upgrading to Release 4.3.0 and upgrade as necessary. If firmware was upgraded, *do not* reload the router in this step. The reload occurs as part of the package activation step. However, if you are upgrading from R4.2.3 to R4.3.0, enable **auto fpd** in admin mode to automatically upgrade the firmware. Refer to Section "Release 4.3.0 FPD Upgrade" for more information.
3. Select appropriate packages from CCO image tar file and create a separate R4.3.0 tar file specific to your environment. Install add the R4.3.0 tar file.
4. **Review the Section "Caveats" before performing the actual upgrade for any known limitation and workaround. Note: special instructions needed to add/upgrade bng and video pies.**
5. After the **admin install add** has completed successfully, run the **admin install activate** on R4.3.0 packages. After the router has reloaded and contains the R4.3.0 packages, perform the **admin install commit**.

6. Verify if firmware upgrade is needed after upgrading to R4.3.0 and upgrade as necessary. If firmware was upgraded manually, then reload the router for firmware changes to take effect. Refer to Section "Release 4.3.0 FPD Upgrade" for more information.
7. Turboboot is the option to perform downgrades from R4.3.0 to pre-R4.3.0 images. Refer the Section “Downgrade from IOS XR Release 4.3.0” for more information.

2. Verifications Before Upgrading

The following table outlines the commands that must be run before beginning the Upgrade procedure.

Table 1. Verifying Before Upgrading

No.	Commands	Verification to be performed
1	`Admin show platform`	Verify the following that all the nodes are in "IOS XR RUN" state, SPAs in "OK" state, Fan Tray and Power Modules are in “READY” state.
2	`Admin show redundancy`	For Dual RSP/RP systems, verify that the Active and Standby RSPs are available and in “ACTIVE role” and in “is ready” state.
3	`Show interface summary`	Verify that all the relevant interfaces are running.
4	`Admin show install active / inactive / committed summary`	Verify that the correct set of packages is active / inactive / committed.
5	`Show filesystem`	Check the actual disk0: size to ensure that sufficient disk space is available for the upgrade. A minimum of **845 MB** free disk space is needed for upgrade to R4.3.0. If the available disk space is not enough, refer to Section “Guidelines for Repartitioning SMUs”.
6	`Dir bootflash: location 0/RSP0/CPU0`	Bootflash device should not be used to save user specific files or configurations. Extraneous files such as configs files should be removed from bootflash.
7	`copy running-config tftp://...running config.txt`	Copy the running-configuration to a temporary storage location, for example: tftp, compactflash:, harddisk:
8	`Admin copy running-config tftp://...admin-running config.txt`	Copy the admin running-configuration to a temporary storage location, for example: tftp, compactflash, harddisk.
9	`ping <tftp_server_address>`	If you are unable to reach the Mgmt LAN or TFTP_SERVER, please check the Mgmt Port states and route configuration for Mgmt LAN
10	`no mirror location 0/RSP0/CPU0 disk0:disk1:`	Disable disk mirroring, if it is enabled on the router, before proceeding to the next step. Disk mirroring can increase the upgrade time.
11	`Admin install remove inactive`	Remove old versions of the inactive packages and SMU files from the router. Use the **admin-command**. The **install remove inactive test sync** commands can be used first to show packages that will be removed from the disk.
12	`Harddisk space check: Applies to upgrade from 423 to 430.`	Auto fpd feature is officially supported for upgrades from R4.2.3 to R4.3.0 onwards. Please ensure that the harddisk has a minimum of 400 MB space while doing the upgrade from R4.2.3 to R4.3.0 with auto fpd enabled.
13	Disable auto fpd for upgrades from pre 4.2.3 images to 4.3.0 – `(admin-config)#no fpd auto-upgrade`	If user is upgrading from any pre-R4.2.3 image, it is recommended to disable auto-fpd in admin config mode. Auto-fpd is fully supported from R4.2.3 onwards
14	Set the logging buffer size to 307200 or greater .	Prior to upgrading to R4.3.0, set the logging buffer size to a value of 307200 or greater (logging buffered 307200).

	(config)#logging buffered 307200	

3. Mandatory SMUs (Upgrade and Downgrade)

The following table outlines the SMUs that must be installed for upgrade and downgrade procedure. For example, to upgrade from R4.0.0, CSCtk65746 SMU must be installed prior to the upgrade.

Table 2. Needed Mandatory SMUs

From Release	Mandatory SMUs (p)		Mandatory SMUs (px)	
	Upgrade SMUs	**Downgrade SMUs**	**Upgrade SMUs**	**Downgrade SMUs**
R4.0.0	CSCtk65746	No*	N/A	No*
R4.0.1	CSCtj90504, CSCto05713	No*	N/A	No*
R4.0.3	No	No*	N/A	No*
R4.1.0	No	No*	N/A	No*
R4.1.1	No	No*	N/A	No*
R4.1.2	CSCty67156	No*	N/A	No*
R4.2.0	CSCub41271** CSCtx89601 CSCtx28089 CSCtl84822 CSCua50217 CSCtz47970 CSCtz35514 CSCtz65963 CSCty98459	No*	CSCtx89601 CSCtx28089 CSCtl84822 CSCua20673 CSCua50217	No*
R4.2.1	CSCub41271**	No*	No	No*
R4.2.2	No	No*	No	No*
R4.2.3	CSCud98419***	No*	CSCud98419***	No*
R4.3.0	N/A	N/A	N/A	N/A

* Turboboot is needed to downgrade from 4.3.0-px to any previous images. This is because R430 image is a combo image unlike pre-430 images which has –p and –px versions.

** The Repartition Tool SMU (CSCub41271) should be used if disk space required for the upgrade to succeed is inadequate. Refer to Section "Guidelines for Repartitioning Tool SMU" to determine when to use the repartitioning tool. Follow the operating instructions mentioned in the RSP2 Disk Repartition Guide. This guide is a part of the README file provided along with the SMU. Once the repartition is completed, remove the repartition SMU CSCub41271. After disk repartitioning, install the rest of the SMUs and perform the upgrade to R4.3.0.

*** The SMU for CSCud98419 should be used if fpd auto-upgrade option is being used during the upgrade. Please refer to Section "Release 4.3.0 FPD Upgrade" for more information.

3.1 Guidelines for Repartitioning Tool SMU

The following section describes guidelines on when to use the repartitioning SMU.

Step 1. Check for disk0 usage on the router.

Step 2. Disk space required for base R4.3.0 software + optional pies is approximately **845 MB** (excluding any recommended SMUs).

Step 3. Determine the space required for any mandatory SMUs for R4.3.0 (for example Combo-SMU pack)

Step 4. Verify the total disk space on the disk0: from the router. This should be approximately 1.6 GB

If Total [(Step1 + Step2 + Step3) < (Step 4)] then repartition SMU is not needed.

If Total {[(Step1 + Step2 + Step3) - (Step 4)] >=0MB and <=300MB} then repartition SMU is warranted for upgrade to succeed.

Note: If the disk space is still not adequate after repartitioning. Step 3 can be skipped in the event upgrade is possible with removal of any inactive or mandatory SMUs. Mandatory SMU can be added once R4.3.0 is active on the box. In that case, the router should be reloaded additionally.

4. Selection of Packages for Upgrade

1. Download the tar file from http://www.cisco.com and untar it onto a tftpserver.
2. The downloaded tar file can be untarred using the command:

   ```
   tar –xvf ASR9K-iosxr-px-k9-4.3.0.tar
   ```

   The difference in the **ASR9K-iosxr-px-k9-4.3.0.tar** and **ASR9K-iosxr-px-4.3.0.tar** should be the addition of the crypto pie in the former. All the other packages should be same.
3. Select the R4.3.0 base package and individually select optional packages that are needed for your environment. For example, if the current active packages contains optional pies such as mpls, doc, mgbl, k9sec, optic pies, and etc., then the same packages must be added during R4.3.0 upgrade.

   There are 2 ways in which these packages can be added to the router.

   a. Add the packages individually.

      ```
      admin install add source <source path>asr9k-mpls-px.pie-4.3.0 asr9k-doc-px.pie-4.3.0 asr9k-mgbl-px.pie-4.3.0 asr9k-k9sec-px.pie-4.3.0 asr9k-optics-px.pie-4.3.0 synchronous
      ```

   b. Create a tar file and add it using the install tar option. Create a separate directory on the tftpserver and copy the optional and R4.3.0 base packages. Creating a tar file can be done using the command from that directory:

      ```
      tar –cvf ASR9K-px-4.3.0.tar *
      ```

   c. Once the file is tarred, the tar file is ready to be added to the router using the following command

```
admin install add tar <tar file source location/ASR9K-px-4.3.0.tar>
synchronous
```

5. Upgrade to IOS XR Release 4.3.0

Perform upgrade pre-checks prior executing the below upgrade steps, refer to Section "Verifications before Upgrading".

Review the Section "Caveats" before performing the actual upgrade for any known limitation and workaround. Note: special instructions needed to add/upgrade bng and video pies.

All install operations should be performed in the admin mode.

1. Add the required packages to the disk using one of the options (source, tar option, individual packages (specifying source-path for each package)):

    1. `RP/0/RSP0/CPU0:router(admin)#install add <source>/<source-path>/ <pie-1><pie-2><pie-3>... <pie-n>  sync`

    2. `RP/0/RSP0/CPU0:router (admin)# install add tar <source-path>/<tar-file> sync`

    3. `RP/0/RSP0/CPU0:router(admin)# install add <source-path>/asr9k-mini-px.pie-4.3.0 <source-path>/asr9k-mcast-px.pie-4.3.0 <source-path>/asr9k-mgbl-px.pie-4.3.0 <source-path>/asr9k-mpls-px.pie-4.3.0 <source-path>/asr9k-k9sec-px.pie-4.3.0 <source-path>/asr9k-video-px-4.3.0 sync`

    If there are any other optional packages installed from prior releases, the new package list should match or supersede the old release package list and must be added using the above-mentioned command. Otherwise, all the conflicting optional packages have to be deactivated before the upgrade/downgrade [followed by 'install commit' operation]. The effect of this is loss of the configuration supported by the pie.

    Example of Active/Inactive/Committed packages summary after R4.3.0 installation add is completed:

Inactive Packages	Active Packages	Committed Packages
disk0:asr9k-mini-px-4.3.0	disk0:asr9k-mini-px-4.2.1	disk0:asr9k-mini-px-4.2.1
disk0:asr9k-mcast-px-4.3.0	disk0:asr9k-mcast-px-4.2.1	disk0:asr9k-mcast-px-4.2.1
disk0:asr9k-mgbl-px-4.3.0	disk0:asr9k-mgbl-px-4.2.1	disk0:asr9k-mgbl-px-4.2.1
disk0:asr9k-mpls-px-4.3.0	disk0:asr9k-mpls-px-4.2.1	disk0:asr9k-mpls-px-4.2.1
disk0:asr9k-video-px-4.3.0	disk0:asr9k-video-px-4.2.1	disk0:asr9k-video-px-4.2.1
disk0:asr9k-k9sec-px-4.3.0	disk0:asr9k-k9sec-px-4.2.1	disk0:asr9k-k9sec-px-4.2.1
disk0:asr9k-optic-px-4.3.0	disk0:asr9k-optic-px-4.2.1	disk0:asr9k-optic-px-4.2.1
disk0:asr9k-doc-px-4.3.0	disk0:asr9k-doc-px-4.2.1	disk0:asr9k-doc-px-4.2.1
disk0:asr9k-bng-px-4.3.0		

2. Perform Test Activation of the inactive packages using the following command:

```
RP/0/RSP0/CPU0:router(admin)#install activate <source>:<pie1> <source>:<pie-2>...
<source>:<pie-n> test sync
```

Note: Testing the activation gives a preview of the activation. No actual changes will be made when 'test' option is used. Any config that is incompatible with the new version being activated will be identified via 'show configuration removed' command and the same can be reapplied via 'load config removed <config>.cfg' command.

3. Activate inactive packages added in Step 1 using one of the following commands:

```
RP/0/RSP0/CPU0:router(admin)#install activate <source>:<pie-1> <source>:<pie-2>
... <source>:<pie-n> sync

RP/0/RSP0/CPU0:router (admin)#install activate disk0:*4.3.0* sync
```

Note: The Router will reload at the end of activation to start using the new packages. This operation will impact traffic. Typically this operation may take at least 20 minutes to complete.

Note: Packages can be specified multiple times using a wild card option.

6. Turboboot Option for Upgrades

If a TURBOBOOT to R4.3.0 image on the RSP440 system is planned, rommon version 0.61 and above is required to load R4.3.0 combo image. Verify the rommon version of the RSP440 by using the admin command “show hw-module fpd location all”.

R4.2.3 image contains rommon version 0.62 hence there is no FPD SMU required to update the rommon. R4.2.0 and R4.2.1 images contain rommon version 0.46 and 0.51 respectively. FPD SMU CSCud79917 (R4.2.0) and CSCud79890.(R4.2.1) will be provided upon request for rommon version 0.62. These FPD SMU must be activated and rommon upgraded prior TURBOBOOT R4.3.0 image. Refer to Cisco “Install and Upgrade Guide” user guide for the complete TURBOBOOT procedure.

7. Verify Post-Upgrade or Downgrade

Table 3. Post-Upgrade/Downgrade Steps

No	Commands	Verification to be performed
1.	`Admin show platform`	Verify that all the nodes are in "IOS XR RUN" state, SPAs in "OK" state, Fan Tray and Power Modules are in “READY” state
2.	`Admin show redundancy`	Verify that Active and Standby RSP are available and in “ACTIVE role” and “is ready” states
3.	`Admin install commit`	After Upgrade is successful, perform the “admin install commit” from admin mode.
4.	`Admin show install active/inactive/committed summary`	Verify that proper set of packages are in active, inactive and committed state “admin show install active/inactive/committed summary”.
5.	`Show configuration failed startup`	Verify if there were any failed startup configs.
6.	`Clear config inconsistency`	In an event there is a config loss, perform “Clear configuration inconsistencies”.
7.	`Show install verify packages / install verify package / install verify package repair`	Upon successful upgrade checks for package and image integrity. Any anomalies found must be repaired using the command. “install verify package repair”.
8.	`Cfs check`	Verify/ fix configuration file system.
9.	`mirror location 0/RSP0/CPU0 disk0:disk1:`	Enable disk mirroring after the upgrade has completed.

10.	`Show interface summary`	Verify that all the concerned interfaces are up.
11.	`Show hw-module fpd location all`	Verify if firmware must be updated after a successful upgrade. If Firmware upgrade is needed, upgrade it and reload the Line card or router for firmware changes to take effect.
12.	`Disk Cleanup (optional)`	Once software upgrade or downgrade has been completed, disk space can be recovered by removing any inactive packages that are no longer needed (if the packages are required at a later time, they can be re-added):

Note: If system issues are detected or if the upgrade needs to be backed out for any reason, please refer to Section "Downgrade from IOS-XR Release 4.3.0" to roll back the software to the starting point.

8. Release 4.3.0 FPD Upgrade

Auto-fpd feature is fully supported for upgrade from R4.2.3 onwards.
The feature could be enabled from the admin-config mode as follows:
(*RP/0/RSP0/CPU0:BNG1(admin-config)#fpd auto-upgrade*).

Auto-fpd feature is not supported for upgrade from pre-R4.2.3.
Please disable the feature form admin config mode if upgrading from a pre-4.2.3 release:
(*RP/0/RSP0/CPU0:BNG1(admin-config)#no fpd auto-upgrade*).

Manual fpd upgrade can be performed after R4.3.0 upgrade is install committed. Run the "show hw-module fpd location all" command to check which firmware files need to be upgraded, by inspecting the Upg/Dng column. If there is any 'Yes' marked, manual upgrade is required.

Procedure to Upgrade FPD firmware (R4.3.0)

1. Run the "show hw-module fpd location all" command to check which firmware files need to be upgraded:

```
RP/0/RSP0/CPU0:router(admin)# show hw-module fpd location all

===============================================================
                    Existing Field Programmable Devices
                  ==============================================
                                   HW                          Current SW       Upg
Location         Card Type        Version  Type     Subtype Inst   Version          Dng?
===============================================================

0/RSP0/CPU0      A9K-RSP-4G       4.8      lc       fpga3   0      1.18             Yes
                 lc       fpga1            0        1.05    No
                 lc       fpga2            0        1.15    No
                 lc       cbc              0        1.02    No
                 lc       fpga4            0        3.08    No
                 lc       hsbi             0        4.00    No
                 lc       rommon           0        1.02    Yes
--------------------------------------------------------------------------------------------
0/RSP0/CPU0      ASR-9010-FAN     1.0      lc       cbc     1      4.00             No
--------------------------------------------------------------------------------------------
0/RSP0/CPU0      ASR-9010-FAN     1.0      lc       cbc     2      4.00             No
--------------------------------------------------------------------------------------------
```

… Snipped …

Note: In the output above, the column ‘Upg/Dng?’ points to the down-rev firmware software versions, which need to be upgraded.

2. Issue the following command to upgrade fpd:

```
RP/0/RSP0/CPU0:router(admin)#upgrade hw-module fpd all location all
```

Note: Except CBC update, router reload is required after running the “upgrade hw-module fpd all location all” command, to make the changes in effect.

Note: No reload is required after running the upgrade **hw-module fpd cbc location all** command. The new CBC firmware will be active. The software automatically resets the local CAN Bus.

9. Downgrade from IOS XR Release 4.3.0

Turboboot is the only option to downgrade R4.3.0 to pre-430 image. This is because R4.3.0 image is a combo image unlike pre-430 images which has –p and –px versions.

If R4.3.0 package is not admin install committed on the router, reload location all command will revert back to the prior committed release package.

10. Caveats

1. In the Cisco ASR 9000 Series Router Software Release 4.0.0, the minimum configurable logging buffered size has been increased to 307200. Any configuration with a value less than 307200 fails to upgrade to Release 4.3.0.
    a. Run the show configuration failed startup command on startup to display the failed configuration.
    b. Workaround: Prior to upgrading to Release 4.3.0, set the logging buffer size to a value of 307200 or greater (logging buffered 307200).
2. CSCub41271: Repartitioning Tool SMU. If user encounters any issue with disk0: space while upgrading to R4.3.0 on RSP (RSP2) based systems, the following are suggested.

- Do "dir disk0:" and "dir disk1:" and see if there are any "unwanted" files are present. This means configs stored as backup, crash logs, debug logs etc.. If present, move them to harddisk:

- Do "sh install inactive summary" and remove all the inactive images

- If space is still a constraint then use the Repartitioning Tool SMU CSCub41271 to repartition disk0: and disk1:, to gain 300 MB of disk space

3. CSCud44547: Inactive packages not shown when attempting R4.2.3 to R4.3.0 upgrade. This issue will be seen if os-mbi smus are in inactive packages while doing the upgrade. Remove the inactive os-mbi package by issuing “admin install remove inactive <os-mbi-pie>”.
4. CSCuc24233: BNG functionality did not work after R4.3.0 upgrade. In R4.3.0, bng pie needed to be installed for bng functionality to work. Due to this defect, bng pie cannot be loaded along with the base packages. To work around this, save all bng configs prior to the upgrade. Perform the upgrade **without** the bng pie. Once, the router is active with R4.3.0 packages, install add the bng pie. Issues “clear configuration inconsistency” in admin and exec modes before install activates the bng pie.
5. CSCua24311: AAA attribute configuration can be applied only when bng pie is active. To work around this, save the output of "show run aaa" before the upgrade and restore it after bng pie is activated.
6. CSCud59659: Video pie incompatibility error – In RSP2 system, upgrading to R4.3.0 requires video pie to be installed in separate steps. First add the video pie using install add command, follow by install activate the video pie.
7. CSCud82484: R4.3.0: install commit fails on ASR9010 cluster, Event Mgr sees no response – In some rare instances, this problem may be hit on the ASR9K Cluster setup while doing an image upgrade. When this problem is hit, install commit will fail with the system complaining about communication problem for a node on the system. This happens after the upgrade has completed and the user is trying to commit the software for persistence across router reloads. When this condition is hit, the node in question will be up and in “IOS XR RUN” state. The workaround for this problem is simply to restart the ‘insthelper’ on the specific node using the ‘proc restart insthelper location x/x/xcpux’ command. Please see release notes attached to the DDTS for additional details.