

Cisco ASR9K

IOS-XR Release 7.3.2

IOS-XR System Upgrade Procedure

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1 Introduction

1.1 Purpose, Scope and Audience

The purpose of this document is to describe the upgrade and downgrade procedure for the Cisco ASR 9000 Series Aggregation Services Router, Release IOS XR 7.3.2.

Audience: This guide is for Cisco Systems Field Engineers and Network Operators. It is split into four sections.

- 1) Simple one command install upgrade procedures & detailed IOS XR install upgrade procedures
- 2) Other boot options
- 3) FPD upgrade
- 4) Caveats and CLI changes

1.2 Upgrade/downgrade Matrix

Single Step Upgrade/Downgrade is supported for following releases:

From	To
IOS XR 6.6.x	IOS XR 7.3.2
IOS XR 7.0.x	IOS XR 7.3.2
IOS XR 7.1.x	IOS XR 7.3.2
IOS XR 7.3.x	IOS XR 7.3.2

For any other releases, not mentioned in the above table, it is recommended to first upgrade to one of the above supported releases and then move to the target (IOS XR 7.3.2) release.

The following link can be used to download the upgrade document for 7.0.2 release (File name: ASR9K-x64-docs-7.0.2.tar)

<https://software.cisco.com/download/home/282414851/type/280805694/release/7.0.2>

1.3 Summary of Upgrade Steps

Any of the below methods can be used for upgrade.

Method A:

- Use CSM server to perform the upgrade

Method B:

- Add the image to the router using `install add source <source remote location or local directory> <packages>`
- Install prepare and install activate the software

Method C:

- Use single command upgrade: `install source <source remote location or local directory> <packages>`

Method D:

- Use single command upgrade: `install replace harddisk:/asr9k-goldenk9-x64-7.3.2_IMAGE.iso noprompt commit`

This document covers Method B.

The following list is an overview of the steps covered in this document.

1. Backup existing configuration
2. Perform system and network maintenance tasks
3. Add the image to the router using tftp, http, sftp, scp, via `install add source`
4. Activate the image via `install activate`
5. Commit the software via `install commit`

1.4 Cisco Software Manager

CSM Server is a web-based, server-side automation and orchestration framework. It gives service providers the ability to simultaneously schedule and deploy SMUs & software upgrades across hundreds of routers in a scheduled manner through a simple point and click Web interface.

More information on CSM: [Download CSM/ CSM Documentation](#)

1.5 Mandatory SMUs

The following table outlines the Bridge SMUs that must be installed for upgrade and downgrade procedure.

Table 1: Needed Mandatory SMUs

	Upgrade Bridge SMUs	Downgrade Bridge SMUs
IOS XR 6.6.x	CSCvw57276 (XR and sysadmin)	NA
IOS XR 7.0.x	CSCvw57276 (XR and sysadmin)	NA
IOS XR 7.1.1/ IOS XR 7.1.15	CSCvw57276 (XR and sysadmin)	NA
IOS XR 7.1.2/ IOS XR 7.1.3	NA	NA
IOS XR 7.3.x	NA	NA

** Bridge SMU install will require router reload.

** Upgrade from IOS XR 7.1.2/ IOS XR 7.1.3 to IOS XR 7.3.2, we need to mention full rpm name (CSCvu77427). Wildcard not supported

Example:-

Scenario 1 : #install activate *732* noprompt (not supported)

Scenario 2 : #install activate asr9k-eigrp-x64-1.0.0.0-r73144I noprompt (Supported)

1.6 Packages for Upgrade

As software features grow, so do file sizes. In order to ease the downloading experience and TFTP size issues, Cisco is changing its package delivery system by providing multiple files of smaller sizes as shown below.

Table 2: New IOS-XR Packaging Format

File	Contents	Comment
asr9k-mini-x64-7.3.2.iso	64-bit mini.iso image only	Contains 64-bit mini.iso upgrade image only
ASR9K-x64-iosxr-px-7.3.2.tar	All 64-bit rpms. No mini.iso and k9sec rpm.	Contains all rpms except the mini.iso
ASR9K-x64-iosxr-px-k9-7.3.2.tar	All 64-bit rpms. No mini.iso.	Contains all rpms including k9sec except the mini.iso
NCS5000-iosxr-7.3.2.tar	64-bit NCS5000 satellite tar	Contains 64-bit NCS5000 satellite tar
asr9k-cnbng-x64-1.0.0.0-r732.x86_64.rpm	CnBNG rpm	Contains CnBNG RPM require to run Cnbng Services.
asr9k-mini-x64-migrate_to_eXR.tar-7.3.2	64-bit migration consists of mini.iso	64-bit migration tar file. Refer "ASR9K-Migration-to-ios-xr-64-bit" documentation on CCO.
asr9k-x64-usb_boot-7.3.2.zip	Cisco ASR9000 64-BIT IOS XR Software	Contains USB Boot Package

1.7 Required Package files

The mini ISO Package is mandatory to perform the System Upgrade and upgrade needs to be done from XR VM. The additional XR packages listed below are needed depending on the router configuration and required features.

Name	Package Name	Description
Boot Image	asr9k-mini-x64-7.3.2.iso	Boot image
9000V	asr9k-9000v-nV-x64-1.0.0.0-r732.x86_64.rpm	Includes rpm to support Cisco ASR9000v Series Router Software and to support Cisco ASR 9000v Series Router as a satellite for Cisco ASR 9000 Series Router
OPTIC	asr9k-optic-x64-1.0.0.0-r732.x86_64.rpm	Firmware for the optics feature for Cisco ASR 9000 Series Aggregation Services Router Chassis. It enables Transport / OTN feature under interfaces.
MCAST	asr9k-mcast-x64-2.0.0.0-r732.x86_64.rpm	Includes Multicast Routing Protocol support Features
MPLS	asr9k-mpls-x64-2.0.0.0-r732.x86_64.rpm	Includes MPLS support Features
EIGRP	asr9k-eigrp-x64-1.0.0.0-r732.x86_64.rpm	Includes EIGRP Protocol support Features
K9sec	asr9k-k9sec-x64-2.1.0.0-r732.x86_64.rpm	Support for Encryption, Decryption,, Secure Shell (SSH), Secure Socket Layer (SSL), and Public-key infrastructure (PKI).
m2m	asr9k-m2m-x64-2.0.0.0-r732.x86_64.rpm	Machine to Machine interfaces.
ISIS	asr9k-isis-x64-1.1.0.0-r732.x86_64.rpm	Includes ISIS Protocol support Features
MGBL	asr9k-mgbl-x64-2.0.0.0-r732.x86_64.rpm	IPSLA and MIBs are part of the mgbl rpm.
MPLS TE	asr9k-mpls-te-rsvp-x64-2.1.0.0-r732.x86_64.rpm	MPLS Traffic Engineering (MPLS-TE), Resource Reservation Protocol (RSVP).
OSPF	asr9k-ospf-x64-1.0.0.0-r732.x86_64.rpm	Includes OSPF Protocol support Features
Services	asr9k-services-x64-1.0.0.0-r732.x86_64.rpm	Includes rpm to support Cisco IOS XR 64-bit inline MAP-T function
LI	asr9k-li-x64-1.1.0.0-r732.x86_64.rpm	Includes LI software images.
BNG-Support	asr9k-bng-suppl-x64-1.0.0.0-r732.x86_64.rpm	BNG Support is pre-requisite for BNG or CnBNG
BNG	asr9k-bng-x64-1.0.0.0-r732.x86_64.rpm	Includes binaries to support BNG features
CnBNG	asr9k-cnbngr-x64-1.0.0.0-r732.x86_64.rpm	Includes binaries to support CnBNG features

** BNG and CnBNG rpms are mutually exclusive.

2 Pre-Upgrade Tasks

Note: Config backup, precheck, image download, tar file copy to router and install add are hitless operations and can be done outside of the upgrade maintenance window.

2.1 Configuration Backup

- 1) Copy the running-configuration to a harddisk: on the router:

```
RP/0/RP0/CPU0:ASR9K#copy running-config harddisk:/running_config
```

- 2) Copy the running-configuration to a remote scp server:

```
RP/0/RP0/CPU0:ASR9K#scp harddisk:/<file name> <user-name>@<server-IP>:/PATH
```


2.2 System Stability check

The following commands should be executed at the XR prompt to verify basic system stability before the upgrade.

show platform	verify that all nodes are in "IOS XR RUN/OPERATIONAL" state
show platform vm	verify that all nodes are in "FINAL Band" state
show redundancy	verify that a Standby RP is available and the system is in "NSR-ready" state
show ipv4 interface brief <or> show ipv6 interface brief <or> show interface summary	verify that all necessary interfaces are "UP"
show install active	verify that the proper set of packages are active
admin show install active	verify on sysadmin plane
show install committed	verify that the proper set of committed packages are same as active. If not, execute 'install commit'
cfs check/ clear configuration inconsistency	verify/fix configuration file system
show hw-module fpd	Ensure all the FPD versions status are CURRENT Please refer to "Field Programmable Versions Document" for FPD version information.
show pfm location all	Shows any outstanding alarms in system
show alarms	Shows any outstanding alarms in system
admin show environment all	Shows temperature, Fan, Voltage, Power status
admin show led	Shows LED status
show media (both XR and Admin mode)	Shows the disk usage in XR and admin state
show inventory	Shows chassis inventory information
show logging	Capture show logging to check for any errors

2.3 Cost out IGP

To minimize traffic loss during the upgrade please follow below steps:

For OSPF use “max-metric” command.

```
router(config-ospf)# max-metric router-lsa
```

For ISIS use “spf-overload-bit” command.

```
router(config-isis)# set-overload-bit
```

2.4 Enable auto-fpd upgrade

Enable auto FPD auto upgrade from XR and Sysadmin.

```
router(config)#fpd auto-upgrade enable  
router(config)#commit
```

2.5 Disk Cleanup

Check available space in install repository. At least 2G of free space is required to perform system upgrade.

If copying the packages and SMUs to the harddisk, ensure 50% free space on the harddisk. Check both the XR and admin plane.

```
XR:
RP/0/RP0/CPU0:ASR9K# show media location 0/RP0/CPU0
RP/0/RP0/CPU0:ASR9K# show media location 0/RP1/CPU0
```

```
Admin:
sysadmin-vm:0_RP1# show media location 0/RP0
sysadmin-vm:0_RP1# show media location 0/RP1
```

Check inactive packages and remove them before upgrading in XR and Admin plane.

```
XR: RP/0/RP0/CPU0:ASR9K#install remove inactive all
```

```
Admin: sysadmin-vm:0_RP0# install remove inactive
```

Check and delete core files and any other files which are not required in harddisk in XR and admin plane.

```
XR:
RP/0/RP0/CPU0:ASR9K#run
[xr-vm_node0_RP0_CPU0:~]$cd /misc/disk1
[xr-vm_node0_RP0_CPU0:/misc/disk1]$rm *core*
```

```
Admin:
RP/0/RP0/CPU0:ASR9K#admin
sysadmin-vm:0_RP0# run
[sysadmin-vm:0_RP0:~]$ cd /misc/disk1
[sysadmin-vm:0_RP0:~]$ rm *core*
```

3 Software Upgrade

All System Upgrade related install operations should be done in the XR VM plane. The optional packages (mpls, mcast, mgbl etc.) that are being installed/upgraded must match the active packages, else the install will fail.

- Recommend enabling `fpd auto-upgrade enable` before starting the software Upgrade.
- Download the IOS XR 7.3.2 image (mini.iso and optional RPMs .tar) from CCO. Untar the RPMs and create a single tar that includes the mini.iso and all optional RPMs. Copy tar file to scp server and verify the contents of the tar file:

```
tar -tvf 7.3.2-iso-and-rpms.tar
```

- Copy the 7.3.2 tar file to the router harddisk and verify that file is copied successfully:
`RP/0/RP0/CPU0:A9K#scp <user-name>@<server-IP>:/PATH/<image file> /misc/disk1/`
- Verify the md5 checksum of the tar/individual rpms with the original MD5 values on CCO:
`[xr-vm_node0_RP0_CPU0:/misc/disk1]$md5sum <tar file>`

- Perform ‘install add’ of the IOS XR 7.3.2 tar file:
`RP/0/RP0/CPU0:A9K#install add source harddisk:/ 7.3.2-iso-and-rpms.tar`
- Take a note of the install operation id generated by the add operation in previous step:
`Install operation id# finished successfully`

- Add recommended SMUs for IOS XR 7.3.2 if not already in initial tarball (optional):
`RP/0/RP0/CPU0:A9K#install add source harddisk: <mandatory SMU tar file>`
- Take a note of the install operation id generated by the add operation in previous step.
`Install operation id# finished successfully`

- Prepare the packages added in the previous step:
`RP/0/RP0/CPU0:A9K#install prepare id id#`
Or (if SMU was added)
`RP/0/RP0/CPU0:A9K#install prepare id id1 id2`

- Activate all the packages:
`RP/0/RP0/CPU0:A9K#install activate`
- Router will reload at the end of activation to start using the new packages.



Note

The reload operation may take up to 30 minutes to complete.

- Verify that all the packages are installed correctly in XR and Sysadmin:
`RP/0/RP0/CPU0:A9K#show install active`
`sysadmin-vm:0_RP0# show install active`

- Verify system stability through commands described under Check System Stability section (2.2) after router comes up with new software.
- Verify show version to check router is upgraded:

```
RP/0/RSP0/CPU0:STARLORD-BNG-EXR#sh version
Fri Oct 15 01:35:12.437 UTC
Cisco IOS XR Software, Version 7.3.2
Copyright (c) 2013-2021 by Cisco Systems, Inc.
```

Build Information:

```
Built By      : ingunawa
Built On      : Wed Oct 13 20:22:40 PDT 2021
Built Host    : iox-ucs-019
Workspace     : /auto/srcarchive17/prod/7.3.2/asr9k-x64/ws
Version       : 7.3.2
Location      : /opt/cisco/XR/packages/
Label         : 7.3.2
```

```
cisco ASR9K () processor
System uptime is 9 hours 49 minutes
```

- Check to see if there were startup configurations failed:

```
RP/0/RP0/CPU0:A9K#show configuration failed startup
```

- Execute ‘install commit’ to commit the newly active software (install commit is required after any install activate operation else after router reload, nodes will go back to previously committed software):

```
RP/0/RP0/CPU0:A9K#install commit
```

4 Post-Upgrade Tasks

- Disk cleanup: Once software upgrade 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):

```
RP/0/RP0/CPU0:ASR9k#install remove inactive all
```

- Verify/fix configuration file system (mandatory):

```
RP/0/RP0/CPU0:ASR9k#cfs check
```

- Verify fpd versions running are current:

```
RP/0/RP0/CPU0:ASR9k#show hw-module fpd
```

- Restore IGP metric if changed before the upgrade (this is done from xr vm).

OSPF

```
RP/0/RP0/CPU0:ASR9k(config-ospf)# no max-metric router-lsa
```

ISIS

```
RP/0/RP0/CPU0:ASR9k(config-isis)# no set-overload-bit
```

5 Other Boot Options (GISO/IPXE/USB)

For USB and iPXE, please refer to the chapter “Bring-up the Router” in “System Setup and Software Installation Guide for Cisco ASR 9000 Series Routers, IOS XR Release 7.1.x”:

https://www.cisco.com/c/en/us/td/docs/routers/asr9000/software/asr9k-r7-1/system-setup/configuration/guide/b-system-setup-cg-asr9000-71x/b-system-setup-cg-asr9000-71x_chapter_010.html

For GISO, please refer to the chapter “Customize Installation using Golden ISO”:

https://www.cisco.com/c/en/us/td/docs/routers/asr9000/software/asr9k-r7-1/system-setup/configuration/guide/b-system-setup-cg-asr9000-71x/b-system-setup-cg-asr9000-71x_chapter_0111.html

For instructions on migration to 64-bit, please refer to the following document:

<https://www.cisco.com/c/en/us/td/docs/routers/asr9000/migration/guide/b-migration-to-ios-xr-64-bit.html>

For instructions on upgrading nvSatellite, please refer to the following document:

<https://www.cisco.com/c/en/us/support/docs/routers/asr-9000-series-aggregation-services-routers/118807-technote-asr-00.html>

6 FPD Upgrade

The fpd auto-upgrade feature, if configured on the router, should take care of fpd upgrade. Manual fpd upgrade can be performed after IOS XR 7.3.2 upgrade is install committed. Run the “`show hw-module fpd location all`” command and check which firmware files need to be upgraded by inspecting the Upg/Dng column. If there are any marked ‘Yes’, manual upgrade is required. After manual upgrade, a reload is required for the fpd to take effect. Issue the following command to upgrade FPD:

```
RP/0/RP1/CPU0:router#upgrade hw-module location all fpd all
```

Note: Except CBC update, router reload is required after running the “`upgrade hw-module fpd all location all`” command to make the changes take effect. No reload is required after running the `upgrade hw-module fpd cbc location all` command as the new CBC firmware will be active. The software automatically resets the local CAN Bus. FPD pie is mandatory for the above steps.

Auto-FPD requirements:

- N/A

7 Downgrade from 7.3.2 IOS XR Release

7.1 Pre-Downgrade Tasks

There is no new PID introduce in IOX XR 7.3.2.

7.2 Downgrading IOS XR

There are multiple options to choose from to downgrade IOS XR.

Note: prior to downgrade, disable fpd auto-upgrade in XR and admin.

Option 1: If install commit was not done after upgrade to IOS XR 7.3.2, a router reload will bring it back to previous install committed image.

Option 2: install add downgrade image iso+rpm, prepare and activate

Example:

```
install add source harddisk: asr9k-mini-x64-6.6.3.iso ASR9k-iosxr-x64-6.6.3.tar
install prepare id 338
install activate id 338 noprompt
```

Option 3: If downgrade image is part of inactive packages (the mini ISO is broken down into individual ISOs (XR, sysadmin and host) ex – asr9k-mini-x-6.6.3, asr9k-xr-6.6.3

```
install remove asr9k-mini-x-6.6.3 (this will remove the mini as well as individual ISOs ) and
then install add *mini.iso".
```

Install prepare, activate the inactive packages along with the iso.

Option 4: Install remove the inactive packages and re-add the downgrade iso image+rpm via install add, prepare, activate to downgrade

Note: Please refer to the caveats for known anomalies.

While downgrading from 7.3.2 use “nooptim” option in install prepare/activate CLI. Please refer to the caveats.

E.g.: RP/0/RSP0/CPU0:R4-PE4#install prepare id 10 nooptim

7.3 Post-Downgrade Tasks

- Disk cleanup: Once software upgrade 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:

```
RP/0/RP0/CPU0:ASR9k#install remove inactive all
```

- Verify/fix configuration file system (mandatory):

```
RP/0/RP0/CPU0:ASR9k#cfs check
```

- Verify fpd versions running are current:

```
RP/0/RP0/CPU0:ASR9k#show hw-module fpd
```

- Restore IGP metric if changed before the upgrade (this is done from xr vm)

OSPF

```
RP/0/RP0/CPU0:ASR9k# (config-ospf)# no max-metric router-lsa
```

ISIS

```
RP/0/RP0/CPU0:ASR9k# (config-isis)# no set-overload-bit
```

8 Caveats

- Please refer to DDTS for the unsupported cards from release 6xx: CSCuz35344
- Upgrade from pre IOS XR 7.1.2 release to IOS XR 7.3.2 will require bridge SMUs to be installed prior to upgrade. Please refer to section 1.5(Mandatory SMUs) for more details.
- Wildcard to activate rpm will not work with IOS XR 7.1.2/ IOS XR 7.1.3 release.
- BNG and CnBNG rpms are mutually exclusive.
- CSCvp19524 Make sha512 as default secret in xr-vm and calvados-vm.