

**CRS-1 Upgrade Procedure:**

**3.4.x-3.9.1**

1. Obtain Required PIE files .....	2
2. Install Mandatory SMUs .....	2
3. Check System Stability:.....	3
4. Perform Pre-Upgrade Tasks: .....	4
5) Upgrade: .....	7
6) Downgrade: .....	10
7) Post-Upgrade / Post-Downgrade Procedure .....	12
8) Caveats: .....	13

For the latest upgrade documents please refer to the following page:

[http://www.cisco.com/web/Cisco\\_IOS\\_XR\\_Software/index.html](http://www.cisco.com/web/Cisco_IOS_XR_Software/index.html)

## 1. Obtain Required PIE files

Composite Mini Package is mandatory to perform the upgrade. Additional pies listed below are needed depending on the router configuration and required features:

PIE File Description	Sample PIE Filename	Package Name
Composite Mini Package (OS-MBI, Base, Admin, Fwdg, lc Rout)	comp-hfr-mini.pie-3.9.1	disk0:comp-hfr-mini-3.9.1
Upgrade Package* (see note2)	hfr-upgrade.pie-3.9.1	disk0:hfr-upgrade-3.9.1
Multicast Package	hfr-mcast-p.pie-3.9.1	disk0:hfr-mcast-3.9.1
Manageability Package	hfr-mgbl-p.pie-3.9.1	disk0:hfr-mgbl-3.9.1
MPLS Package	hfr-mpls-p.pie-3.9.1	disk0:hfr-mpls-3.9.1
Security Package	hfr-k9sec-p.pie-3.9.1	disk0:hfr-k9sec-3.9.1
Diagnostic Package	hfr-diags-p.pie-3.9.1	disk0:hfr-diags-3.9.1
Documentation Package	hfr-doc.pie-3.9.1	disk0:hfr-doc-3.9.1
Field Programmable Device package	hfr-fpd.pie-3.9.1	disk0:hfr-fpd-3.9.1
CGN Service Package	hfr-cgn-3.9.1	disk0:hfr-cgn-3.9.1

*Note1: The filenames listed here may not necessarily be the filenames of the actual files since the files can be renamed. The actual filenames used will not affect the operation.*

*Note2: The Upgrade Package is mandatory to perform the upgrade from 3.x to 4.x and downgrade from 4.x to 3.x. This is not mandatory when upgrading/downgrading from 3.x to 3.y or 4.x to 4.y.*

## 2. Install Mandatory SMUs

SMU Filename	hfr-os-mbi-3.4.x.CSCsu23012.pie
DDTS	CSCsu23012
Affected images	This SMU is necessary for upgrades from 3.4.x releases only
SMU Package Name	<boot device> hfr-os-mbi-3.4.x.CSCsu23012-1.0.0
Problem Summary	Image upgrade failed:'There is no ENS reply message stored'
SMU Install Impact	High. Reload SMU.
SMU Install Procedure	Add SMU:  <code>router(admin)#install add &lt;path&gt;/hfr-os-mbi-3.4.x.CSCsu23012.pie sync</code>

	Activate SMU:  <pre>router(admin)#install activate disk0:hfr-os-mbi-3.4.x.CSCsu23012-1.0.0 sync</pre> Commit SMU:  <pre>router(admin)#install commit</pre>
--	--

<b>SMU Filename</b>	hfr-base-3.8.x.CSCsy60113.pie
<b>DDTS</b>	CSCsy60113
<b>Affected images</b>	This SMU is necessary for upgrades from 3.8.x releases on MC (MultiChassis) only
<b>SMU Package Name</b>	<boot device> hfr-base-3.8.x.CSCy60113-1.0.0
<b>Problem Summary</b>	Inventory shows incorrect LRD node state for SC nodes
<b>SMU Install Impact</b>	High - Reload SMU.
<b>SMU Install Procedure</b>	Add SMU:  <pre>router(admin)#install add &lt;path&gt;/hfr-base-3.8.x.CSCsy60113.pie sync</pre> Activate SMU:  <pre>router(admin)#install activate disk0:hfr-base-3.8.x.CSCsy60113-1.0.0 sync</pre> Commit SMU:  <pre>router(admin)#install commit</pre>

### 3. Check System Stability:

The following commands should be executed to verify basic system stability before the upgrade:

- `(admin) show platform` (verify that all nodes are in "IOS XR RUN" state, PLIM's in "OK" and SPAs in "READY" state)
- `show redundancy` (verify that a Standby RP is available and in "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)
- `cfs check/clear configuration inconsistency` (verify/fix configuration file system in exec and admin mode)

## 4. Perform Pre-Upgrade Tasks:

- 1) Due to increasing size of the images sufficient disk space is required to perform the upgrade. 2Gig flash disk option was first introduced in release 3.7.0, optional 4Gig one is available starting 3.8.x release.

**When upgrading to release 3.9.1, a PCMCIA flash disk of 2Gig or larger has to be installed in the system BEFORE the software upgrade is performed.**

Use "show filesystem" command to check the actual disk0 size:

```
RP/0/RP0/CPU0:Router#sho filesystem
Wed Feb 11 15:28:57.401 PST PST
File Systems:

      Size(b)      Free(b)      Type  Flags  Prefixes
      -          -          network  rw  qsm/dev/fs/tftp:
      -          -          network  rw  qsm/dev/fs/rcp:
      -          -          network  rw  qsm/dev/fs/ftp:
      1043456      1005568  dumper-lnk  rw  qsm/dumper_nvram:
      39929724928  39605428224  dumper-lnk  rw  qsm/dumper_harddisk:
      1004994560  184500224  dumper-lnk  rw  qsm/dumper_disk1:
      1024606208  423608320  dumper-lnk  rw  qsm/dumper_disk0:
      62390272    49101348  dumper-lnk  rw
      qsm/dumper_bootflash:
      39929724928  39605428224  harddisk  rw  harddisk:
      1024606208  423608320  flash-disk  rw  disk0:  ←-----
      1004994560  184500224  flash-disk  rw  disk1:
      1043456      1005568  nvram      rw  nvram:
      62390272    49101348  flash      rw  bootflash:
```

If the disk size is smaller than 2Gig please follow "Cisco XR 12000 and CRS-1 Flash Disk Upgrade Tasks" document which can be found at:

[http://www.cisco.com/web/Cisco\\_IOS\\_XR\\_Software/index.html](http://www.cisco.com/web/Cisco_IOS_XR_Software/index.html)

*Note1. Please refer to the following field notice about supported disk:*

<http://www.cisco.com/en/US/ts/fn/631/fn63129.html>

*Note2: if you have already loaded the installation files for the new operating system version onto the router, the 'install remove inactive' will delete these files! Therefore, only load the new packages (via 'install add') after removing the inactive packages.*

*Note3: In order to provide as much room as possible on the disk, one can remove old files from the disk. This may include files which the operator has placed on the disk device such as .pie files or temporary directory that have been created.*

*When preparing for the upgrade to the next version of the operating system, the old, non-operational version should be removed.*

*To remove old SMU files and old versions of the operating system use the admin-commands*

`install commit`

*to ensure all active packages are 'committed', then issue the command*

`install remove inactive`

*The 'install remove inactive test sync' commands can be used first to show which packages will be removed from the disk.*

*Note4: In addition to checking the installation disk device, the bootflash device on the MSCs should also be checked. Extraneous files such as crashinfo files can be removed. To check the free space of the bootflash use the following command:*

`dir bootflash: location 0/1/CPU0`

*Note5: Check if all the cards in the system are all up using the admin command*

`show platform`

*If any card is not booted properly, it has to be replaced or be shut down using the admin command*

`hw-module power disable location <loc>`

*Note6: Verify NVRAM. See 8.5 caveats section of this document for more.*

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

a. Make sure that all the traffic flowing through the router which needs to be upgraded has an alternate path. In this scenario one can take one of the redundant routers out of service, upgrade it and then bring it back into service without any significant traffic loss (this should work for the core routers, for the edge devices usually the redundant path may not be available)

b. Set IGP metric to the highest possible value so the IGP will try to route the traffic through the alternate path. 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
```

- c. After all the software is upgraded restore the IGP metric by removing the commands:

OSPF

```
router(config-ospf)#no max-metric router-lsa
```

ISIS

```
router(config-isis)#no set-overload-bit
```

*Note1: Prior to release 3.8 the above commands have to be run before the 'install activate' command is executed, resulting in a long period of time when the router is taken out of forwarding path. To minimize this behavior starting from release 3.8, an enhancement has been provided which allows the user to 'pause' the install activate command just prior router reloading and to execute configuration changes such as IGP commands listed above. Following command enables this install option*

```
install activate disk0:*3.9.* pause sw-change
```

*The user will be prompted prior to the system reload, at which point the IGP cost-out operation can be executed.*

- 3) Copy the running-configuration and admin-configuration to a temporary storage location. This could be on a remote TFTP server or a device such as the harddisk: or disk0: present on the RP.

```
router#copy running-config tftp://...running_config.txt
```

```
router#admin
```

```
router(admin)#copy running-config tftp://...admin-running_config.txt
```

```
router(admin)#exit
```

- 4) Verify Mgmt access to the router (see caveats section)

## 5) Upgrade:

All install operations should be done admin mode

- 1) Add the required pies to disk:

```
router(admin)# install add <source>/<path>/<pie> sync
```

*Note1: The <source> can be one of disk0:, disk1:, compactflash:, harddisk:, tftp:, ftp: or rcp:.*

*Note2: The above step must be repeated for each pie file, or all of the pies can be added together in a single 'install add ..' command. To add all pies using a single command, list all of the pies (including their source) within the 'install add ..' command in the following manner:*

```
router(admin)# install add <source>/comp-hfr-mini.pie-3.9.1  
<source>/hfr-mcast-p.pie-3.9.1 <source>/hfr-mgbl-p.pie-3.9.1  
<source>/hfr-mpls-p.pie-3.9.1 <source>/hfr-k9sec-p.pie-3.9.1  
<source>/hfr-diags-p.pie-3.9.1 sync
```

*Note3: The use of 'sync' option will prevent the user from executing any other command during the install operation.*

*Note4: Since 3.5.0 release <source> can be specified just once rather than for each package. This simplifies the command:*

```
router(admin)# install add <source> comp-hfr-mini.pie-3.9.1 hfr-mcast-  
p.pie-3.9.1 hfr-mgbl-p.pie-3.9.1 hfr-mpls-p.pie-3.9.1 hfr-k9sec-p.pie-3.9.1  
hfr-diags-p.pie-3.9.1 sync
```

*Note5: Under idle conditions, this command may take at least 35 minutes to complete, during which the router will be fully functional. This operation will take longer to complete on a Multi-Chassis system.*

*Note6: If using optional packages such as the hfr-mgbl package on the system's current release, in order to successfully complete the upgrade to the new release, the optional package must also be added and activated. Alternatively the optional packages have to be deactivated (following by the commit) before the upgrade. Side effect of this is loss of the configuration supported by the package.*

*Note 7: From release 3.6.0 an alternate way of adding and installing pies is available. If the pie files are compressed using tar format they can be loaded on the router using the following command:*

```
router(admin)# install add tar <source>/<path>/<tar_file> sync
```

- 2) Test the activation using the 'test' option. Testing the activation will give you a preview of the activation.

```
router(admin)# install activate disk0:comp-hfr-mini-3.9.1 disk0:hfr-mcast-3.9.1 disk0:hfr-mgbl-3.9.1 disk0:hfr-k9sec-3.9.1 disk0:hfr-mpls-3.9.1 disk0:hfr-diags-3.9.1 sync test
```

*Note1: No actual changes will be made when 'test' option is used.*

*Note2: Any config that is incompatible with the new version being activated will be identified. The 'show configuration removed' command can be used to view what will be removed as result of the software upgrade (see caveats section for details).*

*Note3: Such removed config can be reapplied using the 'load config removed <config>.cfg' command from config mode AFTER the upgrade has been completed see caveats section for details).*

*Note4: From release 3.6 onwards, the 'install' command will accept the use of wildcard pattern matching. The install activate command can be simplified to 'install activate \*3.9\* sync test'.*

*Note5: From release 3.7.0 pies can subsequently be activated using single command based on the install operation id generated after each install command:*

```
router(admin)# install activate id <install_operation_id> sync test
```

*Install operation id is printed after finishing each install command or can be obtained using "show install log" command.*

- 3) Activate all of the packages added in step 1:

```
router(admin)# install activate disk0:comp-hfr-mini-3.9.1 disk0:hfr-mcast-3.9.1 disk0:hfr-mgbl-3.9.1 disk0:hfr-k9sec-3.9.1 disk0:hfr-mpls-3.9.1 disk0:hfr-diags-3.9.1 sync
```

*Note1: The output of 'install add' command executed in step 1 provides the list of names of packages to be used in 'install activate ..' command.*

*Note2: The use of 'sync' option will prevent the user from executing any other command during the install operation.*

*Note3: The router will reload at the end of activation to start using the new packages.*

*Note4: Under idle conditions, this operation may take at least 20 minutes to complete.*

*Note5: From release 3.8 onwards, the install commands 'install activate \*3.9.\* pause sw-change sync' can be used to enable the user to cost the router out of the IGP path just before the router reloads, rather than at the point where the activation commences.*

- 4) Verify system stability through commands described under **Check System Stability** section. If system issues are detected or if the upgrade needs to be backed out for any reason, please follow the steps described in **Downgrade** section to rollback the software configuration.
- 5) Check to see if there were any failed startup config. If there were any startup config that failed to be applied, then refer to the **Caveats** section to see how it should be handled.

```
router# show config failed startup
```

- 6) Commit the newly activated software:

```
router(admin)# install commit
```

*NOTE: In some very rare cases inconsistencies in the content of the internal configuration files can occur. In order to avoid such situations, the following steps are recommended before activating packages:*

- *Clear NVGEN cache:*  
router# **run nvgen -F 1**
- *Create dummy config commit:*  
router# **config**  
router(config)#**hostname <hostname>**  
router(config)#**commit**  
router(config)#**end**
- *Force commit update by using the reload command. **Press "n" when the confirmation prompt appears:***  
router# **reload**  
Updating Commit Database. Please wait...[OK]  
Proceed with reload? [confirm] <- **Press "n"**

***In some cases the following error may be reported:***

```
router#reload  
Preparing system for backup. This may take a few minutes .....System  
configuration backup in progress [Retry later]
```

*In such a case please re-try the command after some time.*

## 6) Downgrade:

- 1) List the available rollback points:

```
router(admin)# show install rollback ?
```

- 2) Identify the rollback point by executing the following show command and analyzing the software configuration at the rollback point:

```
router(admin)# show install rollback <rollback point>
```

*Note1: A valid rollback point must be specified. The output will show list of active packages for that rollback point.*

- 3) Test the rollback operation using the 'test' option. Testing the rollback operation can give you a preview of the rollback.

```
router(admin)# process shutdown sfe_drvr location all
```

```
router(admin)# install rollback to <rollback point> sync test
```

*Note1: "process shutdown sfe\_drvr location all" command is a workaround needed for successful completion of downgrade in the 3.9.1 release. Also check the caveat section for any additional issues.*

*Note2: The output will detect if any incompatible config exist. In such cases, 'show configuration removed' command can be used to view what will be removed as result of the software downgrade.*

*Note3: Removed command can be reapplied at a later time using the 'load config removed <config>.cfg' command from config mode.*

The following is a sample output:

```
Warning: SDR Owner: No incompatible configuration will be removed due to the  
Warning: 'test' option
```

```
Info: SDR Owner: Detected incompatibility between the activated software  
Info: and router running configuration.  
Info: SDR Owner: Removing the incompatible configuration from the running  
Info: configuration.  
Info: SDR Owner: Saving removed configuration in file '20060316131636.cfg'  
Info: on node 'RP/0/0/CPU0:'  
Info: Use the "show configuration removed 20060316131636.cfg" command to  
Info: view the removed config.  
Info: NOTE: You must address the incompatibility issues with the  
Info: removed configuration above and re-apply it to the running  
Info: configuration as required. To address these issues use the  
Info: "load configuration removed 20060316131636.cfg" and "commit"  
Info: commands.
```

Use the command suggested in the above example to display the configuration that will potentially be removed after the downgrade.

- 4) Perform the rollback operation executing commands:

Before "install rollback..." command "process shutdown sfe\_drvr location all" has to be run on the system (see Test Rollback Operation section).

```
router(admin)# install rollback to <rollback point> sync
```

*Note1: Based on the set of packages being activated and deactivated as part of the rollback operation, one or more nodes may be reloaded. Please be patient as this operation could take some time.*

*Note2: If you previously executed 'install remove' command to permanently remove any packages in the rollback configuration then the rollback operation will not proceed. To resolve this issue, run the following command to re-add the relevant packages:*

```
router(admin)# install add <device or tftp>/<path>/<pie> sync
```

*Note3: The use of 'sync' option will prevent the user from executing any other command during the install operation.*

- 5) Restore the original configuration that was backed up in **Perform Pre-Upgrade Tasks** section.

```
router#config
router(config)#load <source/filename>
router(config)#commit replace
router(config)#show configuration failed
Verify any rejected configuration
router(config)#exit
Restore the admin-running-configuration as follows
router#admin
router(admin)#config
router(admin-config)#load <source/filename>
router(admin-config)#commit replace
router(admin-config)#show configuration failed
Verify any rejected configuration
router(admin-config)#exit
router(admin)#exit
```

- 6) Install commit the newly activated software.

```
router(admin)# install commit
```

- 7) Verify system stability through commands described in **Check System Stability** Section.

## 7) Post-Upgrade / Post-Downgrade Procedure

- 1) Restore IGP metric if changed before the upgrade

OSPF

```
router(config-ospf)#no max-metric router-lsa
```

ISIS

```
router(config-isis)#no set-overload-bit
```

- 2) 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):

- Obtain the list of inactive packages and note the names of packages that are not needed:

```
router(admin)# show install inactive brief
```

- Remove the unnecessary inactive packages:

```
router(admin)# install remove disk0:<package_name1>  
disk0:<package_name2> .. disk0:<pkg_nameN> sync
```

or

```
router(admin)# install remove inactive (to remove all inactive packages)
```

*Note1: The use of 'sync' option will prevent the user from executing any other command during the install operation.*

- 2) Verify/fix configuration file system (mandatory)

```
router(admin)#cfs check
```

If "max-metric" or "set overload bit" is set during pre-upgrade task restore the metric using commands specified in section 4.

- 3) Upgrade firmware (mandatory)

Both ROMMON and FPGA firmware needs to be upgraded after the 3.9.1 image installation on the system. For detailed upgrade procedure please refer "IOS XR Firmware Upgrade Guide" document which can be accessed at:

[http://www.cisco.com/web/Cisco\\_IOS\\_XR\\_Software/index.html](http://www.cisco.com/web/Cisco_IOS_XR_Software/index.html)

## 8) Caveats:

1. During software upgrade or downgrade, the system could detect incompatible configuration and remove it from the running configuration. The removed config will be saved to a file on the router. Some configuration could also fail due to syntax or semantic error as the router boots the new version of the software.

The operator must browse the removed or failed configuration and then address the changes so that the config can be properly applied on the new version of software:

- Addressing incompatible and removed configuration:

During the test activation of a new software version, incompatible configuration will be identified and removed from the router running configuration. Syslog and console logs will provide the necessary information on the name of the removed configuration file. To address the incompatible configuration, users should browse the removed configuration file, address the syntax and semantics errors and re-apply the config as required and/or applicable after upgrade.

To display the removed configuration, execute the following command from exec mode:

```
router# show configuration removed <removed config filename>
```

- Addressing failed admin and non-admin configuration during reload:

Some configuration may fail to take effect when the router boots with the new software. These configurations will be saved as failed configuration. During activation of the new software version, operator would be notified via syslog and console log where configuration failed to take effect. To address the failed configuration, user should browse both the admin and non-admin failed configuration, address syntax and semantics errors and re-apply it as required.

To display the failed configuration, execute the following command:

```
router# show configuration failed startup
```

```
router(admin)# show configuration failed startup
```

2. MDR – Minimum Disruption Restart

This feature is not supported for upgrades to 3.9.1 release

3. Limitations with preconfig interface
  - Customer should check whether persistent and running config is same or different. If it is different then it will have problem after reload/upgrade, because reload/upgrade will use persistent config to restore configuration.

**show cfmgr persistent-config** – shows the persistent config in CLI form

**show running-config** – shows running config

- Customer should not use "no interface preconfig <>" if they find the same config exist in both preconfig and activate. "cfs check" command can be used to resolve the inconsistency.

4. QoS WRED configuration incompatibility

After 3.6 release QoS WRED statements are 'collapsed' in that if different random-detect statements using the same match types (EXP, DSCP, Prec etc) are entered with identical min and max threshold values, a single configuration line will be shown in the output of 'show running'. During rollback to the pre 3.6 release QoS policy will be rejected and will need to be manually entered again.

5. NVRAM problems may cause MSC to not boot in upgrade to 3.7 and later releases.

When a customer is upgrading to 3.7 and later releases from an earlier release, defective NVRAM may cause MSC to fail to boot. This has become more noticeable in CRS customer upgrades to 3.8.

In prior releases, if NVRAM had an uncorrectable problem (i.e. a problem that reformatting NVRAM could not solve, such as a battery problem), the card would still finish initialization and function ... though NVRAM-dependent functions like PCDS storage, environmental data storage fail and syslog messages regarding that NVRAM are occasionally seen.

This notice is to make customers planning such an upgrade (to release 3.7 or later) aware of a change in tolerance for defective NVRAM introduced by CSCso39580 in 3.7.

Workaround :

A customer can prevent being caught by surprise by attempting "dir nvram: location all" prior to the upgrade. Marginal or failed NVRAM will error and not return proper results (all RPs and MSCs should give a directory listing of the NVRAM). These cards can be proactively examined, reformat attempted (if there is a format problem or corruption), and replaced (if necessary).

For customers who encounter the problem during an upgrade, a rollback to the pre-3.7 release should allow the MSC to recover and function.

6. Caveats DDTS

CSCsj77582 - report nvram file corrupted for files lost during downgrade

Downgrade from anything above 3.6 (including 3.6) to anything below 3.6 (excluding 3.6) will hit nvram[67]: %MEDIA-NVRAM-4-BADFILES : NVRAM File Corrupted (sa m\_db). This is already in the 3.6 manuals

CSCsy47855 - show install active does not return anything. If present image is 3.5.3 this issue could be encountered

CSCsy44631 - Bundlemgr crash after downgrading from 3.8.2 to 3.5.2. This has been fixed in 3.6.0. This would be encountered on any image pre 3.6.0.

CSCsk97042 - Bundlemgr crash may be triggered after downgrading from 3.9.1 to 3.4.x

CSCtc10487 - Active packages listed with inactive packages after image downgrade - applies to 3.5.4 or below

CSCta97117 - pim & multicast-routing mVPN config changes not backward-compatible

CSCtc32566 - In rare scenarios upgrade / downgrade from 3.6.x may be unsuccessful on the fully populated chassis. Please contact TAC support if this occurs

CSCsy21638 - Memory issue in SP's bootflash observed during downgrade in rare cases. Please contact TAC support if this occurs

CSCtg20877 - banner config end up in config failed startup after upgrade. Issue was seen during upgrade from 3.8.3 to 3.9.1 image

CSCsk76499 - When upgrading from 3.4.x to 3.9.1 directly, please do not install infra test package on 3.4.x. disk space will be depleted on bootflash: