



Cisco Systems

IOS XR Firmware Upgrade Guide

For CRS-1 and XR12000

Version 1.4

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Contents

Contents.....	1
Document control	2
History	2
Review	2
Document Purpose	3
ROMMON 1.52 (CRS-1 Only)	4
Split Boot (CRS-1 Only)	5
ROMMON / FPGA Upgrade Guide	8
Upgrading Firmware on CRS-1.....	11
Upgrading Firmware on XR12000.....	14

Document control

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History

Table 1 *Revision History*

Version No.	Issue Date	Status	Reason for Change
0.1	Dec. 22, 2008	Pre-Draft	First Pre-Draft
0.2	Feb. 4, 2009	Pre-Draft	Second Pre-Draft
1.0	Feb. 6, 2009	Draft	Initial Draft
1.1	Feb. 10, 2009	Draft	Second Draft
1.2	Feb. 12, 2009	Draft	Third Draft
1.3	Feb. 26, 2009	Initial	Firmware Upgrades
1.4	Mar. 5, 2009	Final	Firmware Review Comments Added

Review

Table 2 *Revision Review*

Reviewer's Details	Version No.	Date

Change Forecast: **Medium**

This document will be kept under revision control.

A printed copy of this document is considered uncontrolled.

Document Purpose

The goal of this document is a quick and simple step by step upgrade guide for both CRS and XR12000. It assumes that the operator already has some basic knowledge of IOS XR such as software installation. It also provides links to more detailed documentation.

This document also contains an overview on what the new ROMMON 1.52 on CRS is and what does it to.

ROMMON 1.52 (CRS-1 Only)

ROMMON is used during the initial boot up the cards. This is similar to the way a BIOS works in a computer. Split-Boot is supported from IOS XR Release 3.8 onwards and ROMMON 1.52 is the first version of ROMMON that enables Split-Boot in IOS XR releases that supports it. ROMMON 1.52 is backwardly compatible with older IOS XR releases that do not support split boot.

ROMMON 1.52, changes the boot sequence compared to earlier version of ROMMON in that the router will always check the bootflash: for an Minimum Boot Image (MBI) image file. For IOS XR releases that do not support split boot, there will not be an appropriate MBI image for it in the bootflash. Thus it will display a missing file message such as:

```
No MBI confirmation received from dSC
..
Fail to open file name disk0:hfr-os-mbi-3.6.2/mbihfr-rp.vm
boot: booting from disk0:hfr-os-mbi-3.6.2/mbihfr-rp.vm
```

You can safely ignore this message for IOS XR 3.7 and lower. The subsequent message, booting from disk0:, indicates that the router is booting from the normal disk location as seen in earlier releases of ROMMON.

Users should never copy the MBI file into the bootflash: location in instances where the ROMMON reports a missing a file when the router is running IOS XR 3.7 and lower in an effort to try to get rid of this message. The message is normal for ROMMON 1.52 or higher when using IOS XR releases 3.7 and lower and should be ignored. Since the ROMMON does not actually check for IOS XR versions, it will boot the MBI located in the bootflash: causing a non-split boot supported image to boot up incorrectly to what looks like a Standby RP. It will do this even if no Active RP exist and will not behave as a Standby RP either in the presence of an Active RP.

	FAT16 Support	FAT32 Support via Split Boot and ROMMON 1.52	Split Boot Enabled (Needed for FAT32 Support)	Default ROMMON	Compatible with ROMMON 1.52
IOS XR 3.4	X			1.43 / 1.45	X
IOS XR 3.5	X			1.45 / 1.49	X
IOS XR 3.6	X			1.49	X
IOS XR 3.7	X			1.49 / 1.51	X
IOS XR 3.8	X	X	X	1.52	X

Details:

FAT16 bootable flash disk is supported by all releases.

FAT32 bootable flash disk is supported by IOS XR 3.8 and higher and only if the ROMMON 1.52 or higher is used. It is recommended to upgrade both ROMMON A & B to this version.

Split Boot is supported by IOS XR 3.8 and higher and only if the ROMMON 1.52 or higher is used.

ROMMON 1.52 is compatible with IOS XR 3.4, 3.5, 3.6, 3.7, and 3.8. Having ROMMON 1.52 will not give IOS XR 3.4, 3.5, 3.6, or 3.7 FAT32 or Split Boot support. However, having ROMMON 1.52 or higher and IOS XR 3.8 or higher is required for FAT32 and Split Boot support.

Prior to ROMMON 1.52 Boot Sequence:

1. Look at the boot variable "BOOT". In this example, let's assume "*BOOT=disk0:hfr-os-mpi-3.8.0/mbihfr-rp.vm,1;*"
2. Boot from flash disk0: at the directory `/hfr-os-mpi-3.8.0/mbihfr-rp.vm`.

After ROMMON 1.52 or later Boot Sequence:

1. Look at the boot variable "BOOT". In this example, let's assume "*BOOT=disk0:hfr-os-mpi-3.8.0/mbihfr-rp.vm,1;*"
2. Translate to a temporary boot variable "*bootflash:/disk0/hfr-os-mpi-3.8.0/mbihfr-rp.vm*"
3. Boot from bootflash: the translated location. This temporary boot variable is not stored but translated from the BOOT variable each time.
4. If the MBI is located in the bootflash, boot the MBI file in bootflash then continue to load IOS XR from the flash disk. Since the MBI was booted already, it will now have the ability to read a FAT32 formatted disk.
5. If not, display a message than the MBI file was not found followed by the message that is now booting from the flash disk. Since no MBI was loaded yet, the system can only read from a FAT16 formatted disk.

Split Boot (CRS-1 Only)

Split Boot gives the CRS-1 the ability to boot from a FAT32 volume. XR12000 with PRP-3 has native support for FAT32 thus does not have Split Boot. The CRS gains FAT32 support by installing a MBI (Minimum Boot Image) onto the bootflash of the Route Processor (RP), Shelf Controller (SC-GE22), or Distributed Route Processor (DRP). The bootflash: volume is small at 64MB but uses FAT16 file system so the ROMMON can read and boot from this volume. Here is an example of what the MBI file in bootflash: looks like.

```
RP/0/RP0/CPU0:CRS-E#dir bootflash:disk0/hfr-os-mpi-3.8.0
Wed Mar  4 23:50:45.049 PST PDT

Directory of bootflash:/disk0/hfr-os-mpi-3.8.0

6553602      -rwx  10263452    Sun Feb 22 04:13:01 2009  mbihfr-rp.vm

62390272 bytes total (47097156 bytes free)
```

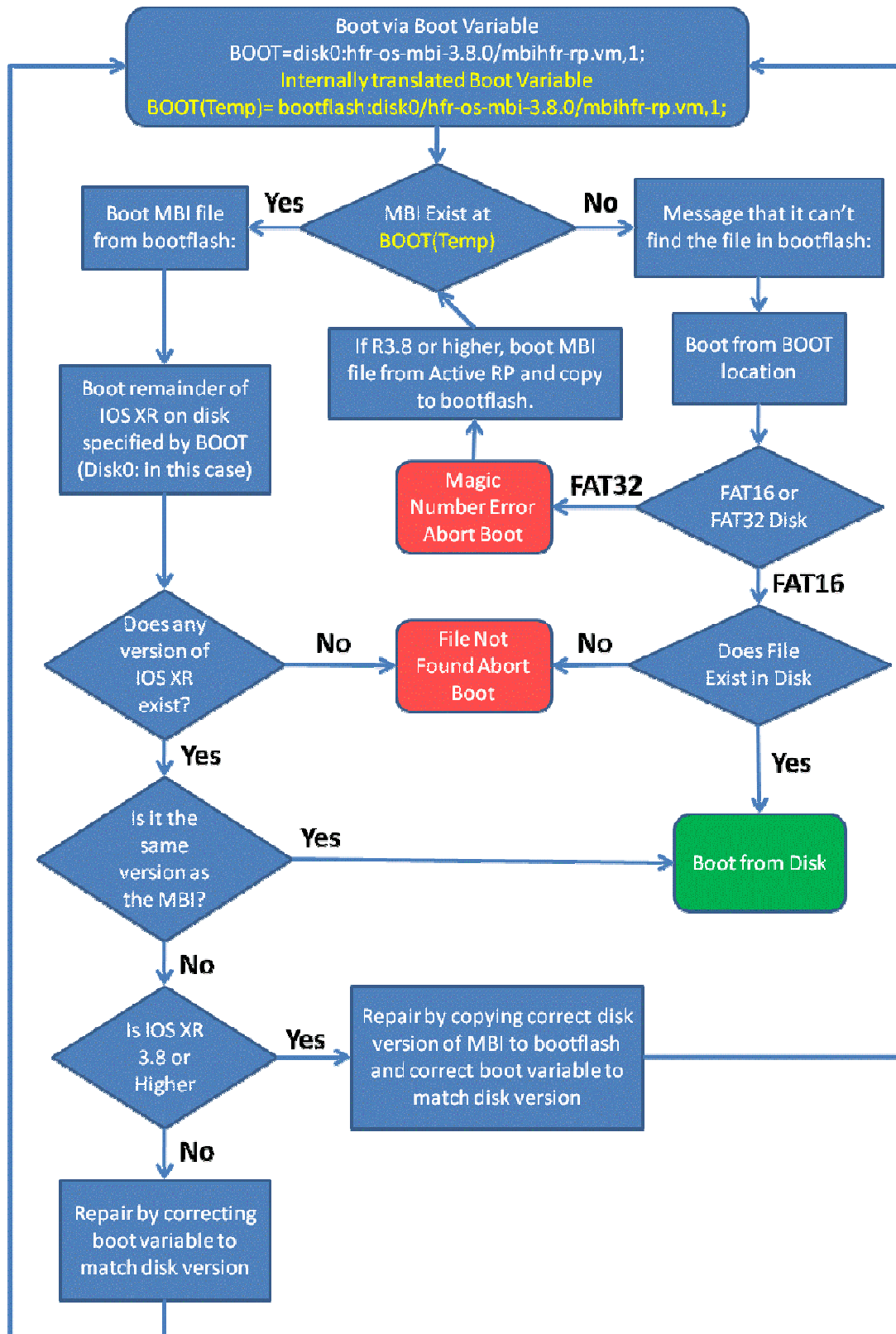
The MBI in turn has the FAT32 file system support. Once the MBI is booted, the router can now read the FAT32 volume and continue booting IOS XR. If you intend to use FAT32, you must use Split Boot regardless of volume size (1GB, 2GB, or 4GB Flash Disk).

You do not need to manually copy the MBI file to the bootflash: since the system will automatically copy it during IOS XR installation. However, you need to make sure that the bootflash of all your Route Processor (RP & RP-B), Shelf Controller (SC-GE22), and DRP (CPU0 & CPU1) have sufficient space in the bootflash: to hold the MBI file before installation of IOS XR. For IOS XR 3.8, the MBI file is 6.5MB but may be larger in later releases. Note that if you have two Split-Boot supported images such as the case with an Active and an inactive Rollback image, there will be two MBI files in your bootflash:. You also need at a minimum ROMMON version 1.52 in order to support Split Boot.

IOS XR 3.8 and higher MBI files are self-correcting. If the bootflash version of the MBI file doesn't match or is missing compared the version on the disk, it will automatically copy the correct MBI file from the flash disk of the Active RP to the bootflash. This includes the inactive version of OS in case of rollback. It will also correct the boot variable if they are incorrect.

For example, the router has IOS XR 3.8.0 installed, the boot variable in ROMMON will be set to "*BOOT=disk0:hfr-os-mbi-3.8.0/mbihfr-rp.vm,1,*". With ROMMON 1.52 and higher and an IOS XR version that supports Split Boot like IOS XR 3.8, it will first boot the MBI file "*bootflash:/disk0/hfr-os-mbi-3.8.0/mbihfr-rp.vm*" from Bootflash:. It will then boot the remainder of the IOS XR from Disk0:. In this example, the location is Disk0: if you have Disk1: as well and the Bootflash: path for the file will be "disk1 "1. It will do this regardless if the flash disk is formatted in FAT16 or FAT32. However if you have a FAT32 formatted disk and the MBI does exist in Bootflash, it will correct the problem by booting the MBI file over the Control Ethernet from the Active RP.

Split-Boot Flow Chart:



ROMMON / FPGA Upgrade Guide

Firmware upgrades are done after you have already installed and activated the target IOS XR release. You need to have the FPD.PIE installed to upgrade the firmware. During any firmware upgrade, it's important not to abort or disturb the upgrade. Doing so may render the card permanently disabled.

For CRS, the only exception is ROMMON B which is recoverable even after a reload of the card. Normally it's not necessary to upgrade ROMMON A as the version in ROMMON B will be used. But if your ROMMON is lower than 1.52, upgrading ROMMON A & B is necessary to avoid any problems with the FAT32 file system for IOS XR 3.8 and higher.

Here are some important rules to remember when upgrading firmware including ROMMON to ensure a successful upgrade.

1. Do not stop the upgrade in the middle...period.
2. Do not use Control-C or any other break character to stop and upgrade.
3. Make sure your exec-timeout value is set to "0 0" so it will timeout your console or telnet session.
4. Do not reload any card or the router until the upgrade is complete.
5. Do not perform any RP switchovers until the upgrade is complete.
6. Do not remove any card from the router until the upgrade is complete.
7. Do not power off either physically or by software any card or router until the upgrade is complete.
8. Do not remove any flash cards from the router until the upgrade is complete. (Just in case the source of the firmware binaries are on that flash card.)
9. In IOS XR 3.4, do not use any auto reset flag for the firmware upgrade commands. It does not work correctly hence it was removed in later releases.
10. Look at the time table below so you know how long to wait for the firmware upgrade to complete.
11. Look at the log messages to ensure no failure to upgrade the firmware has occurred before reloading the router or resetting any cards.

Troubleshooting: *If there was an error burning the new firmware onto a card, do not reset that card. Instead, try re-burning the firmware on that location again. Here is an example of that command if we need to re-burn the ROMMON on RP1.*

```
RP/0/RP0/CPU0:CRS-E(admin)# upgrade hw-module fpd rommon location 0/rp1/cpu0
Thu Feb 26 20:02:37.797 PST PDT
```

```
% RELOAD REMINDER: - The upgrade operation of the target module will not interrupt its
normal
```

```
operation. However, for the changes to take effect, the target module
will need to be manually reloaded after the upgrade operation. This can
be accomplished with the use of "hw-module <target> reload" command.
```

- If automatic reload operation is desired after the upgrade, please use the "reload" option at the end of the upgrade command.
- The output of "show hw-module fpd location" command will not display correct version information after the upgrade if the target module is not reloaded.

```
Continue? [confirm]
```

```
Starting the upgrade/download of following FPD:
```

```
=====
Location      Type Subtype Upg/Dng   Current   Upg/Dng
              Version  Version
=====
```

```

=====
0/RP1/CPU0 lc rommon upg 1.45 1.52
-----
RP/0/RP1/CPU0:Feb 26 20:02:39.357 : lc_fpd_upgrade[259]: %PLATFORM-UPGRADE_FPD-6-START
: Starting to upgrade rommon subtype image from 1.45 to 1.52 for for this card on
location 0/RP1/CPU0
RP/0/RP1/CPU0:Feb 26 20:02:39.369 : upgrade_daemon[401]: Start Upgrade...
RP/0/RP1/CPU0:Feb 26 20:02:39.370 : upgrade_daemon[401]: programming...with file
/net/node0_RP0_CPU0/disk0:/hfr-fpd-3.8.0.30I/fpd/ucode/rommon-hfr-ppc7455-asmp-B.bin
RP/0/RP1/CPU0:Feb 26 20:02:39.377 : upgrade_daemon[401]: Verifying
/net/node0_RP0_CPU0/disk0:/hfr-fpd-3.8.0.30I/fpd/ucode/rommon-hfr-ppc7455-asmp-B.bin:
RP/0/RP1/CPU0:Feb 26 20:02:40.672 : upgrade_daemon[401]: Passed.
RP/0/RP1/CPU0:Feb 26 20:02:47.277 : upgrade_daemon[401]: Verifying ROMMON B:
RP/0/RP1/CPU0:Feb 26 20:02:47.339 : upgrade_daemon[401]: Passed.
RP/0/RP1/CPU0:Feb 26 20:02:47.339 : upgrade_daemon[401]: OK, ROMMON B is programmed
successfully.

RP/0/RP1/CPU0:Feb 26 20:02:47.342 : lc_fpd_upgrade[259]: %PLATFORM-UPGRADE_FPD-6-PASSED
: Successfully upgrade rommon subtype image for for this card on location 0/RP1/CPU0
% Successfully upgraded 1 FPD for RP on location 0/RP1/CPU0

```

Here is an example of that command if we need to re-burn the FPGA on the SIP-800 on Slot 2 with a lower logging level.

```

RP/0/RP0/CPU0:Router(admin)# upgrade hw-module fpd fpga force location 0/2/cpu0
Thu Feb 26 21:07:45.474 PST PDT

% RELOAD REMINDER: - The upgrade operation of the target module will not interrupt its
normal
operation. However, for the changes to take effect, the target module
will need to be manually reloaded after the upgrade operation. This can
be accomplished with the use of "hw-module <target> reload" command.
- If automatic reload operation is desired after the upgrade, please use
the "reload" option at the end of the upgrade command.
- The output of "show hw-module fpd location" command will not display
correct version information after the upgrade if the target module is
not reloaded.
Continue? [confirm]

Starting the upgrade/download of following FPD:

=====
Location      Type Subtype Upg/Dng   Current   Upg/Dng
              Type Subtype Upg/Dng   Version   Version
=====
0/2/CPU0     lc  fpga  upg      5.0       6.0
-----

% Successfully upgraded 1 FPD for CRS1-SIP-800 on location 0/2/CPU0

```

If you continue to have burn errors on that card, do not reset or remove that card. That card will continue to operate normally until it is reset. Use that fact and get a replacement card first.

Expected upgrade times per card for a given type for CRS.

Firmware upgrades are serial. So if there are 12 cards that need a ROMMON upgrade, it will take about 2 minutes. MSC has an SP ROMMON and CPU ROMMON so they will take twice as long. Also, if ROMMON A & B needs to be upgraded, they are done separately.

ROMMON = 10 Seconds
 OC48 and 10GE PLIM = 3 Minutes
 OC48, OC192, 1GE, and 10GE SPA = 1 Minute
 OC3 and OC12 SPA = 2 Minutes
 ATM SPA = 9 Minutes
 SIP-800 = 7 Minutes

To see the current version of firmware per IOS XR release, see the link:
http://www.cisco.com/web/Cisco_IOS_XR_Software/pdf/SoftwareFirmwareCompatibilityMatrix.pdf

Upgrading Firmware on CRS-1:

This is the only officially supported way to upgrade firmware. It is done after IOS XR has been upgraded already and the FPD.PIE is installed and activated. It can upgrade both ROMMON and FPGA. The main drawback is that you must reload the router again or reset the card after the firmware is upgraded to activate it.

Below is a list of steps that needs to be taken to upgrade the firmware. For detailed information on upgrading the ROMMON, go to URL:

http://www.cisco.com/en/US/docs/ios_xr_sw/iosxr_r3.8/rommon/configuration/guide/rm38ucrs.html

1. Upgrade to IOS XR 3.8 and have the routing running that version.
2. Install the optional FPD.PIE if not done so already.
3. Use the admin command "`show hw-module fpd location all`". This will show you all the firmware that the system wants to upgrade on the router. All the cards it wants to upgrade will have Upgrade / Downgrade field marked with "Yes".

```

RP/0/RP0/CPU0:CRS-E(admin)# show hw-module fpd Location all
Fri Feb 13 09:23:24.876 PST PDT

===== Existing Field Programmable Devices =====
=====
Location      Card Type              HW      Current SW Upg/
Version      Type Subtype Inst  Version  Dng?
=====
0/3/SP        YYY-XXXIface          0.4    lc      rommonA 0      1.52    No
              lc      rommon  0      1.52    No
-----
0/3/CPU0      OC48-POS-16-ED        0.80   lc      fpga    0      9.0     No
              lc      rommonA 0      1.52    No
              lc      rommon  0      1.52    No
-----
0/4/SP        YYY-XXXIface          0.4    lc      rommonA 0      1.49    No
              lc      rommon  0      1.49    No
-----
0/4/CPU0      CRS1-SIP-800          0.104  lc      fpga    0      5.0     Yes
              lc      rommonA 0      1.49    Yes
              lc      rommon  0      1.49    Yes
-----
0/14/0        SPA-1X10GE-L-V2      1.2    spa     fpga    0      1.9     No
-----
0/14/5        SPA-8X1GE-V2         1.0    spa     fpga    5      1.10    No
-----
0/RP0/CPU0    RP                    0.6    lc      rommonA 0      1.49    Yes
  
```

				lc	rommon	0	1.49	Yes
0/RP1/CPU0	RP	0.6	lc	rommonA	0	1.49	1.49	Yes
			lc	rommon	0	1.49	1.49	Yes
0/SM0/SP	Fabric HS123	0.1	lc	rommonA	0	1.52	1.52	No
			lc	rommon	0	1.52	1.52	No
0/SM1/SP	Fabric HS123	0.1	lc	rommonA	0	1.52	1.52	No
			lc	rommon	0	1.52	1.52	No
0/SM2/SP	Fabric HS123	0.1	lc	rommonA	0	1.52	1.52	No
			lc	rommon	0	1.52	1.52	No
0/SM3/SP	Fabric HS123	0.1	lc	rommonA	0	1.52	1.52	No
			lc	rommon	0	1.52	1.52	No

- Optional: Using the time table below and calculate the approximate time the operation it will take. The amount of time can be substantial depending on your cards and configuration. So in this example, it will take 1.5 minutes to upgrade all the ROMMON B, 1.5 minutes to upgrade all the ROMMON A. And 7 minutes if we decide to upgrade the SIP-800 too.
- Upgrade ROMMON B only via the admin command `upgrade hw-module fpd rommon location all` or upgrade ROMMON B and other FPGA via the admin command `upgrade hw-module fpd all location all` *Note that ROMMON A will not be upgraded with either of these commands. ROMMON A must be upgraded explicitly.

```
RP/0/RP0/CPU0:CRS-E(admin)# upgrade hw-module fpd rommon location all
Fri Feb 13 09:54:51.527 PST PDT

% RELOAD REMINDER: - The upgrade operation of the target module will not interrupt
its normal
operation. However, for the changes to take effect, the target module
will need to be manually reloaded after the upgrade operation. This can
be accomplished with the use of "hw-module <target> reload" command.
- If automatic reload operation is desired after the upgrade, please use
the "reload" option at the end of the upgrade command.
- The output of "show hw-module fpd location" command will not display
correct version information after the upgrade if the target module is
not reloaded.
Continue? [confirm]
This can take some time for a full chassis.
Ensure that system is not power cycled during the upgrades.
Please consult the documentation for more information.
Continue ? [no]: yes

Starting the upgrade/download of following FPD:

=====
Location      Type Subtype Upg/Dng   Current   Upg/Dng
              =====
0/4/CPU0     lc   rommon  upg       1.49      1.52
=====

LC/0/4/CPU0:Feb 13 09:55:47.575 : lc_fpd_upgrade[182]: %PLATFORM-UPGRADE_FPD-6-
START : Starting to upgrade rommon subtype image from 1.52 to 1.52 for for this
card on location 0/3/CPU0
LC/0/4/CPU0:Feb 13 09:55:47.610 : upgrade_daemon[333]: Start Upgrade...
LC/0/4/CPU0:Feb 13 09:55:47.611 : upgrade_daemon[333]: programming...with file
/net/node0_RP0_CPU0/disk0:/hfr-fpd-3.8.0.25I/fpd/ucode/rommon-hfr-ppc7455-asm-
B.bin
LC/0/4/CPU0:Feb 13 09:55:47.619 : upgrade_daemon[333]: Verifying
/net/node0_RP0_CPU0/disk0:/hfr-fpd-3.8.0.25I/fpd/ucode/rommon-hfr-ppc7455-asm-
```

```

B.bin:
LC/0/4/CPU0:Feb 13 09:55:48.935 : upgrade_daemon[333]: Passed.
LC/0/4/CPU0:Feb 13 09:55:56.360 : upgrade_daemon[333]: Verifying ROMMON B:
LC/0/4/CPU0:Feb 13 09:55:56.444 : upgrade_daemon[333]: Passed.

```

6. If your ROMMON is lower than 1.52, also upgrade ROMMON A, otherwise this step can be skipped. This command is hidden so operators only upgrade ROMMON A when told to do so. The admin command is `upgrade hw-module fpd rommona location all`.

```

RP/0/RP0/CPU0:CRS-E(admin)# upgrade hw-module fpd rommona location all
Fri Feb 13 09:59:18.961 PST PDT

% RELOAD REMINDER: - The upgrade operation of the target module will not interrupt
its normal
    operation. However, for the changes to take effect, the target module
    will need to be manually reloaded after the upgrade operation. This can
    be accomplished with the use of "hw-module <target> reload" command.
- If automatic reload operation is desired after the upgrade, please use
the "reload" option at the end of the upgrade command.
- The output of "show hw-module fpd location" command will not display
correct version information after the upgrade if the target module is
not reloaded.
Continue? [confirm]
This can take some time for a full chassis.
Ensure that system is not power cycled during the upgrades.
Please consult the documentation for more information.
Continue ? [no]: yes

Starting the upgrade/download of following FPD:

=====
Location      Type Subtype Upg/Dng   Current   Upg/Dng
              =====
              Version   Version
0/4/CPU0      lc   rommonA upg       1.49      1.52
-----

LC/0/4/CPU0:Feb 13 09:59:43.059 : lc_fpd_upgrade[182]: %PLATFORM-UPGRADE_FPD-6-
START : Starting to upgrade rommonA subtype image from 1.52 to 1.52 for for this
card on location 0/3/CPU0
LC/0/4/CPU0:Feb 13 09:59:43.069 : upgrade_daemon[333]: Start Upgrade...
LC/0/4/CPU0:Feb 13 09:59:43.070 : upgrade_daemon[333]: programming...with file
/net/node0_RP0_CPU0/disk0:/hfr-fpd-3.8.0.25I/fpd/ucode/rommon-hfr-ppc7455-asm-
A.bin
LC/0/4/CPU0:Feb 13 09:59:43.077 : upgrade_daemon[333]: Verifying
/net/node0_RP0_CPU0/disk0:/hfr-fpd-3.8.0.25I/fpd/ucode/rommon-hfr-ppc7455-asm-
A.bin:
LC/0/4/CPU0:Feb 13 09:59:44.386 : upgrade_daemon[333]: Passed.
LC/0/4/CPU0:Feb 13 09:59:52.156 : upgrade_daemon[333]: Verifying ROMMON A:
LC/0/4/CPU0:Feb 13 09:59:52.238 : upgrade_daemon[333]: Passed.

% SuccLC/0/4/CPU0:Feb 13 09:59:52.239 : upgrade_daemon[333]: OK, ROMMON A is
programmed successfully.
essLC/0/4/CPU0:Feb 13 09:59:52.243 : lc_fpd_upgrade[182]: %PLATFORM-UPGRADE_FPD-6-
PASSED : Successfully upgrade rommonA subtype image for for this card on location
0/4/CPU0
fully upgraded 1 FPD for YYY-XXXIface on location 0/4/CPU0

```

7. Reload the router or reset each card to activate the new firmware. If you want to avoid a reload, reset each card that was upgraded and perform switchovers on the RPs and SCs and

wait for the Standby to become ready in between. However, this method overall takes more time than a router reload.

8. When all the cards have reloaded, use the admin command “[show hw-module fpd location all](#)” to check if all the cards have been upgraded to the desired firmware version.

Upgrading Firmware on XR12000:

Upgrading the firmware on XR12000 is done after IOS XR has been upgraded already and the FPD.PIE is installed and activated. There is ROMMON, FPGA, as well as MBUS and Fabric-Downloader. The main drawback is that you must reload the router again or reset the card after the firmware upgraded to activate it.

XR12000 has similar command to the CRS to upgrade firmware but is not as well integrated at the time of this writing. In XR12000 the SPA FPGA and SPA ROMMON versus the ROMMON, MBUS, and Fabric Download is upgrade using two different commands.

*Note: MBUS and Fabric-Downloader will always use the version that came with IOS XR. If the version does not match the versioned burned onto the ROM, it will simple download the correct version into RAM but this make the card boot up a bit slower.

For IOS XR 3.8 on XR12000 the current firmware versions are as follows:

RP ROMMON = v1.20
LC ROMMON = v17.1
Fabric-Downloader = v8.0
MBUS = v4.4

Below is a list of steps that needs to be taken to upgrade the firmware. For detailed information on upgrading the ROMMON, go to URL:

http://www.cisco.com/en/US/docs/ios_xr_sw/iosxr_r3.8/rommon/configuration/guide/rm38ucrs.html

1. Upgrade to IOS XR 3.8 and have the routing running that version.
2. Install the optional FPD.PIE if not done so already.
3. Use the admin command “[show hw-module fpd location all](#)”. This will show you all the SPA firmware that the system wants to upgrade on the router. All the cards it wants to upgrade will have Upgrade / Downgrade field marked with “Yes”. This command does not show if any ROMMON, MBUS, or Fabric-Downloader needs to be updated. There is not an equivalent command to show that information. However, you can use the command “[show diag](#)” to check what version on the cards. (This is not the same as the command “show diagnostic”).

```
RP/0/0/CPU0:Router(admin)# show diag
Thu Feb 26 22:37:05.490 PST PDT
SLOT 4 (RP/LC 4): 1 Port ISE Packet Over SONET OC-48c/STM-16 Single
Mode/SR SC-SC connector
  MAIN: type 77, 800-18817-02 rev A0 dev 63033
        HW config: 0x02 SW key: 00-00-00
  PCA: 73-7398-08 rev A0 ver 7
        HW version 1.0 S/N SAD0632003R
  MBUS: Embedded Agent
        Test hist: 0x00 RMA#: 00-00-00 RMA hist: 0x00
  DIAG: Test count: 0x00000000 Test results: 0x00000000
  FRU: Linecard/Module: OC48X/POS-SR-SC
        Route Memory: MEM-LC-1024=
        Packet Memory: MEM-LC1-PKT-512=
  L3 Engine: 3 - ISE OC48 (2.5 Gbps)
```



```
Verifying image: vvvvvvvvvvvvvvvvvvvvvvvvvvvvvvvvvvvvvvvvvvvvvvvvvvvvvvvv
Upgraded linecard fabric-downloader successfully

Slot 5 is not in IOX Running state

Slot 6 is not in IOX Running state

Slot 7 is not in IOX Running state

Slot 8 is not in IOX Running state

Slot 9 is not in IOX Running state
```

5. Use the admin command “`upgrade mbus location all`” to upgrade the MBUS on the entire router

```
...snip...

RP/0/0/CPU0:GSR-3(admin)# upgrade mbus location all
Thu Feb 26 22:17:11.074 PST PDT

Upgrading the MBUS agent rom on slot 4
RP/0/0/CPU0:Feb 26 22:17:39.242 : upgrade_mbus[65802]: %PLATFORM-MBUS-7-
API_INFO_DUMP : download status slot 4, DOWNLOAD_SUCCESS
Slot 4 upgrade successful
RP/0/0/CPU0:Feb 26 22:17:41.428 : upgrade_mbus[65802]: %PLATFORM-MBUS-7-
API_INFO_DUMP : download status slot 4, PROGRAM_ROM SUCCESS
Upgrade complete. The new MBUS ROM image will execute after the next power
cycle or card physical OIR

...snip...
```

6. Use the admin command “`upgrade rommon location 0/1/cpu0`” to the ROMMON on the Route Processor. (The location of your Router Processor may differ.) Then when RP has reloaded, repeat for the other Route Processor.

```
RP/0/0/CPU0:Router(admin)# upgrade rommon location 0/1/cpu0
Thu Feb 26 22:49:15.190 PST PDT

% RELOAD WARNING:
   RP ROMMON upgrade starting. If successful, RP will be reloaded.
Continue ? [no]: yes

RP/0/1/CPU0:Feb 26 22:49:18.023 : rp_romupgrade[373]: %PLATFORM-UPGRADE-3-
RP_WARNING : RP ROMMON upgrade starting
===== Slot 1 =====
Starting to upgrade rom-monitor
Erasing sectors: eeeeeeee
Programming image: ppp
Verifying image: vvv
Upgraded RP rom-monitor successfully

Reloading RP now
```


7. If there are FPGA on SPA ROMMON that needs upgrading, use the command “[upgrade hw-module fpd location all](#)” to upgrade the SPA firmware.
8. Reload the router or reset each card to activate the new firmware.
9. When all the cards have reloaded, use the admin command “[show diag](#)” and “[show hw-module fpd location all](#)” to check if all the cards have been upgraded to the desired firmware version.

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