



Upgrading Field-Programmable Device

An FPD is a field programmable logic device which contains non-volatile, re-programmable memory to define its internal wiring and functionality. The contents of this non-volatile memory are called the FPD image or FPD firmware. Over the lifespan of an FPD, FPD firmware images may need upgrades for bug fixes or functionality improvements. These upgrades are performed in the field with minimum system impact.

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Overview of FPD Image Upgrade

An FPD image is used to upgrade the software on an FPD.

Whenever a new IOS XR version is released, the software package includes FPD images. However ,generally the FPD image isn't automatically upgraded. You must manually upgrade the FPD image when you upgrade the Cisco IOS XR software image.

FPD versions must be compatible with the Cisco IOS XR software that is running on the router; if an incompatibility exists between an FPD version and the Cisco IOS XR software, the device with the FPGA may not operate properly until the incompatibility is resolved.

Restrictions for FPD Upgrade

The Optics FPD Upgrade Service is not available using the **upgrade hw-module fpd** command.

You can upgrade Optics FPD using the **upgrade optics port filename /harddisk:/cl1.bin location** command.

For more information on optics FPD upgrade, see *Upgrade QDD Optical Modules* in Upgrade the Router Chapter in Cisco IOS XR Setup and Upgrade Guide for Cisco 8000 Series Routers.

Restrictions For Automatic FPD Upgrade

The following FPDs do not support Auto FPD Upgrade:

- Optics FPDs
- Power Module FPDs
- Timing FPDs

Types of FPD Upgrade Service

An FPD image package is used to upgrade FPD images. The **install activate** command is used to place the FPD binary files into the expected location on the boot devices.

Supported Upgrade Methods

Method	Remarks
Manual Upgrade	Upgrade using CLI, force upgrade supported.
Auto Upgrade	Upgrade using install SMU activation or during image upgrade. User can enable/disable auto upgrade feature.

Manual FPD upgrade

Manual FPD upgrade is performed using the **upgrade hw-module fpd** command. All cards or all FPGA in a card can be upgraded. If reload is required to activate FPD, the upgrade should be complete. Line-cards, fabric cards and RP cardsInterface module (IMs) and RSPs can't be reloaded during the process of the FPD upgrade.

FPD upgrade is transaction-based:

- Each fpd upgrade CLI execution is one transaction.
- Only one transaction is allowed at any given time.
- One transaction may include one or many FPD upgrades.

Once the upgrade is complete, the router/the card (on which the FPD is upgraded) must be reloaded.

The **force** option can be used to forcibly upgrade the FPD (regardless of whether it's required or not). It triggers all FPDs to be upgraded or downgraded. The **force** option can also be used to downgrade or upgrade the FPGAs even after the version check. However, the **force** option must be used cautiously and only to recover a component from a failed upgrade.



Note

- Sometimes, FPDs can have primary and backup images.
- The use of the **force** option when performing an FPD upgrade isn't recommended except under explicit direction from Cisco engineering or TAC for a one-time purpose only.
- A new FPD upgrade should be issued only when previous FPD upgrades have been completed on the same FPD with the following syslog message:

```
RP/0/RP0/CPU0:May 10 10:11:44.414 UTC: fpd-serv[205]: %INFRA-FPD_Manager-1-UPGRADE_ALERT
: FPD Upgrade Completed (use "show hw-module fpd" to check upgrade status)
```

Automatic FPD Upgrade

By default, the FPD image is not automatically upgraded. You must manually upgrade the FPD image running on the Field Replaceable Unit (FRU) when you upgrade the Cisco IOS XR software image.

However, if you enable the **fpd auto-upgrade** command in administration configuration mode, FPD images are automatically updated in the following instances.

- Software upgrade is carried out.
- Field Replaceable Unit(FRU) such as Line cards, RSPs, Fan Trays or alarm cards are added to an existing router or reloaded.

For the automatic FPD upgrade to work on a system upgrade, the following conditions must be met:

- The FPD package installation envelope (PIE) must be installed on the router.
- The FPD PIE must be activated together with the new Cisco IOS XR image.
- The **fpd auto-upgrade** must be configured in the administration configuration mode.

For the automatic FPD upgrade to work on a FRU Insertion or reload , the following conditions must be met:

- The FPD package installation envelope (PIE) must be installed and activated on the router.
- The **fpd auto-upgrade** must be configured in the administration configuration mode.



Note

Although the FPD upgrade is performed during the install operation, there is no install commit performed. Therefore, once the FPD has been upgraded, if the image is rolled back to the original version, the FPD version is not downgraded to the previous version.

The automatic FPD upgrade is not performed in the following instances:

- Line cards or other cards or alarm cards are added to an existing router.
- A line card chassis is added to an existing router.
- A non-reload software maintenance upgrade (SMU) or PIE installation is performed, even where the FPD image version changes. Since a non-reload installation is, by definition, not supposed to reload the router, and an FPD upgrade requires a router reload, the automatic FPD upgrade is repressed.



Note

In all cases where the automatic FPD upgrade is not performed, you must perform a manual FPD upgrade using the **upgrade hw-module fpd** command.

FPD auto-upgrade can be enabled and disabled. When auto FPD is enabled, it automatically updates FPDs when a SMU or image changes, including an updated firmware revision. Use the **fpd auto-upgrade** command to disable or enable auto-fpd.

YANG Data Models for Auto FPD Upgrade

YANG is a data modeling language that helps to create configurations, retrieve operational data and execute actions. The router acts on the data definition when these operations are requested using NETCONF RPCs. The data model handles the following types of requirements on the routers for FPD:

Operational Data	Native Data Model	CLI Commands
Auto Upgrade: Enabling or disabling of automatic upgrade of FPD.	Cisco-IOS-XR-fpd-infra-cfg.yang	<ul style="list-style-type: none"> • fpd auto-upgrade enable • fpd auto-upgrade disable
Auto Reload: Enabling or disabling of automatic reload of FPD.	Cisco-IOS-XR-fpd-infra-cfg.yang	<ul style="list-style-type: none"> • fpd auto-reload enable • fpd auto-reload disable

You can access the data models from the [Github](#) repository. To learn more about the data models and put them to use, see the *Programmability Configuration Guide for Cisco 8000 Series Routers*.

How to Upgrade FPD Images

The main tasks of the FPD upgrade service are:

- Check FPD image version to decide if a specific firmware image needs an upgrade or not.
You can determine if an FPD image upgrade is needed using the **show hw-module fpd** command and perform the upgrade, if needed, under the following circumstances:
 - Migrate the software to a later Cisco IOS XR software release.
 - Swap line cards from a system running a different Cisco IOS XR software release.
 - Insert a new line card.
- Automatic FPD Image Upgrade (if enabled) Or Manual FPD Image Upgrade using the **upgrade hw-module fpd** command.
- Invoke the appropriate device driver with a name of the new image to load.

Guidelines for Upgrading FPD

The following are some of the important guidelines to be taken into consideration for upgrading FPD:

- Upgrades to the Cisco IOS XR software might result in an FPD incompatibility. Ensure that you perform the FPD upgrade procedure and resolve all incompatibilities, for the cards to function properly.
- The use of the **force** option when performing a FPD upgrade is not recommended except under explicit direction from Cisco engineering or TAC for a one-time purpose only.
- If your card supports multiple FPD images, you can use the **show fpd package** admin command to determine what specific image to upgrade in the **upgrade hw-module fpd** command.
- A message is displayed when router modules cannot get upgraded during upgrade with **location all** option indicating that the FPGA is intentionally skipped during upgrade. To upgrade such FPGAs, you

can use the CLI command with a particular location explicitly specified. For example, **upgrade hw-module fpd all location 0/3/1**.

- It is recommended to upgrade all FPGAs on a given node using the **upgrade hw-module fpd all location {all | node-id}** command. Do not upgrade the FPGA on a node using the **upgrade hw-module fpd individual-fpd location {all | node-id}** as it may cause errors in booting the card.

Before you begin

- Before performing the manual upgrading the FPD on your router using the **upgrade hw-module FPD**, you must install and activate the `fpd.pie` and `fpd.rpm` package.
- The FPD upgrade procedure is performed while the card is online. At the end of the procedure the card must be reloaded before the FPD upgrade is complete. To reload the card, you can use the **hw-module location location reload** command in Config mode, during the next maintenance window. The upgrade procedure is not complete until the card is reloaded.
- During the FPD upgrade, you *must not* do the following:
 - Reload, perform an online insertion and removal (OIR) of a line card (LC), or power down the chassis. Doing so may cause the node to enter an unusable state.
 - Press **Ctrl-C** if the console appears to hang without any output. Doing so may abort the upgrade.
- If you are not sure whether a card requires an FPD upgrade, you can install the card and use the **show hw-module fpd** command to determine if the FPD image on the card is compatible with the currently running Cisco IOS XR software release.

Step 1 **show hw-module fpd location {all | node-id}**

Example:

```
Router#show hw-module fpd location all
```

or

```
Router#show hw-module fpd location 0/4/cpu0
```

Displays the current FPD image versions for the specified card or all cards installed in the router. Use this command to determine if you must upgrade the FPD image on your card.

In the event of an FPD incompatibility with your card, you might receive the following error message:

```
LC/0/0/CPU0:Jul 5 03:00:18.929 UTC: optics_driver[220]: %L2-OPTICS-3-BAD_FPGA_IMAGE : Detected bad
MI FPGA image programmed in MI FPGA SPI flash in 0/0/CPU0 location: Failed to validate meta data CRC

LC/0/0/CPU0:Jul 5 03:00:19.019 UTC: optics_driver[220]: %L2-OPTICS-3-BACKUP_FPGA_LOADED : Detected
Backup FPGA image running on 0/0/CPU0 - primary image corrupted (@0x8c = 0x44)
RRouter:Jul 5 03:00:48.987 UTC: fpd-serv[301]: %PKT-INFRA-FM-3-FAULT_MAJOR : ALARM_MAJOR
:FPD-NEED-UPGRADE :DECLARE :0/0:
```

Step 2 (Optional) **show fpd package**

Example:

The following example shows a sample output from the **show fpd package** command:

```
Router#show fpd package
```

Field Programmable Device Package					
Card Type	FPD Description	Req Reload	SW Ver	Min Req SW Ver	Min Req Board Ver
8201	Bios	YES	1.23	1.23	0.0
	BiosGolden	YES	1.23	1.15	0.0
	IoFpga	YES	1.11	1.11	0.1
	IoFpgaGolden	YES	1.11	0.48	0.1
	SsdIntelS3520	YES	1.21	1.21	0.0
	SsdIntelS4510	YES	11.32	11.32	0.0
	SsdMicron5100	YES	7.01	7.01	0.0
	SsdMicron5300	YES	0.01	0.01	0.0
	x86Fpga	YES	1.05	1.05	0.0
	x86FpgaGolden	YES	1.05	0.48	0.0
	x86TamFw	YES	5.13	5.13	0.0
	x86TamFwGolden	YES	5.13	5.05	0.0
8201-ON	Bios	YES	1.208	1.208	0.0
	BiosGolden	YES	1.208	1.207	0.0
	IoFpga	YES	1.11	1.11	0.1
	IoFpgaGolden	YES	1.11	0.48	0.1
	SsdIntelS3520	YES	1.21	1.21	0.0
	SsdIntelS4510	YES	11.32	11.32	0.0
	SsdMicron5100	YES	7.01	7.01	0.0
	SsdMicron5300	YES	0.01	0.01	0.0
	x86Fpga	YES	1.05	1.05	0.0
	x86FpgaGolden	YES	1.05	0.48	0.0
	x86TamFw	YES	5.13	5.13	0.0
	x86TamFwGolden	YES	5.13	5.05	0.0
8201-SYS	Bios	YES	1.23	1.23	0.0
	BiosGolden	YES	1.23	1.15	0.0

Displays which cards are supported with your current Cisco IOS XR software release, which FPD image you need for each card, and what the minimum hardware requirements are for the various modules. (A minimum hardware requirement version of 0.0 indicates that all hardware can support this FPD image version.)

If there are multiple FPD images for your card, use this command to determine which FPD image to use if you want to upgrade only a specific FPD type.

The FPD name used in the FPD Description column of the output of the **show fpd package** command includes the last ten characters of DCO-PID. Depending on the slot and port numbers, the FPD name is appended with DCO_0, DCO_1, or DCO_2. For example, the FPD names for CFP2-WDM-D-1HL in port 0 and port 1 are -WDM-D-1HL_DCO_0 and WDM-D-1HL_DCO_1 respectively.

Step 3 **upgrade hw-module fpd** {all | *fpga-type*} [**force**] **location** [all | *node-id*]

Example:

```
Router#upgrade hw-module fpd
all location 0/3/1
.
.
.
Successfully upgraded 1 FPD for SPA-2XOC48POS/RPR
on location 0/3/1
```

```

Router#upgrade hw-module location 0/RP0/CPU0 fpd all
upgrade command issued (use "show hw-module fpd" to check upgrade status)
Router: %SECURITY-SSHD_SYSLOG_PRX-6-INFO_GENERAL : sshd[29745]: Accepted authentication for cisco
from 223.255.254.249 port 39510 ssh2
upgrade hw-module location 0/RP0/CPU0 fpd all RRouter: ssh syslog_proxy[1223]:
%SECURITY-SSHD_SYSLOG_PRX-6-INFO_GENERAL : sshd[29803]: Accepted authentication for cisco from
223.255.254.249 port 39524 ssh2
Router:fpd-serv[265]: %INFRA-FPD_Manager-1-UPGRADE_ALERT : Upgrade for the following FPDs has been
committed:
Router:fpd-serv[265]: %INFRA-FPD_Manager-1-UPGRADE_ALERT : Location          FPD name
Force
Router:fpd-serv[265]: %INFRA-FPD_Manager-1-UPGRADE_ALERT :
=====
Router:fpd-serv[265]: %INFRA-FPD_Manager-1-UPGRADE_ALERT : 0/RP0/CPU0          x86FpgaGolden
FALSE
Router:fpd-serv[265]: %INFRA-FPD_Manager-1-UPGRADE_ALERT : 0/RP0/CPU0          x86Fpga
FALSE
Router:fpd-serv[265]: %INFRA-FPD_Manager-1-UPGRADE_ALERT : 0/RP0/CPU0          SsdMicron5300
FALSE
Router:fpd-serv[265]: %INFRA-FPD_Manager-1-UPGRADE_ALERT : 0/RP0/CPU0          IoFpgaGolden
FALSE
Router:fpd-serv[265]: %INFRA-FPD_Manager-1-UPGRADE_ALERT : 0/RP0/CPU0          IoFpga
FALSE
Router:fpd-serv[265]: %INFRA-FPD_Manager-1-UPGRADE_ALERT : 0/RP0/CPU0          DbIoFpgaGolden
FALSE
Router:fpd-serv[265]: %INFRA-FPD_Manager-1-UPGRADE_ALERT : 0/RP0/CPU0          DbIoFpga
FALSE
Router:fpd-serv[265]: %INFRA-FPD_Manager-1-UPGRADE_ALERT : 0/RP0/CPU0          BiosGolden
FALSE
Router:fpd-serv[265]: %INFRA-FPD_Manager-1-UPGRADE_ALERT : 0/RP0/CPU0          Bios
FALSE
Router:fpd_client[385]: %PLATFORM-FPD_CLIENT-1-UPGRADE_SKIPPED : FPD upgrade skipped for
x86FpgaGolden@0/RP0/CPU0: Image not upgradable
Router:fpd_client[385]: %PLATFORM-FPD_CLIENT-1-UPGRADE_SKIPPED : FPD upgrade skipped for
x86TamFwGolden@0/RP0/CPU0: Image not upgradable
Router:fpd_client[385]: %PLATFORM-FPD_CLIENT-1-UPGRADE_SKIPPED : FPD upgrade skipped for
x86FpgaGolden@0/RP0/CPU0: A dependent FPD upgrade is skipped
Router:fpd_client[385]: %PLATFORM-FPD_CLIENT-1-UPGRADE_SKIPPED : FPD upgrade skipped for
IoFpgaGolden@0/RP0/CPU0: Upgrade not required
Router:fpd_client[385]: %PLATFORM-FPD_CLIENT-1-UPGRADE_SKIPPED : FPD upgrade skipped for
DbIoFpgaGolden@0/RP0/CPU0: Upgrade not required
Router:fpd_client[385]: %PLATFORM-FPD_CLIENT-1-UPGRADE_SKIPPED : FPD upgrade skipped for
BiosGolden@0/RP0/CPU0: Image not upgradable
Router:fpd_client[385]: %PLATFORM-FPD_CLIENT-1-UPGRADE_SKIPPED : FPD upgrade skipped for
SsdMicron5300@0/RP0/CPU0: Upgrade not required as it is current

Router#fpd_client[385]: %PLATFORM-FPD_CLIENT-1-UPGRADE_COMPLETE : FPD upgrade complete for
Bios@0/RP0/CPU0 [image upgraded to version 254.00]
Router:fpd_client[385]: %PLATFORM-FPD_CLIENT-1-UPGRADE_COMPLETE : FPD upgrade complete for
x86TamFw@0/RP0/CPU0 [image upgraded to version 7.10]
Router:fpd_client[385]: %PLATFORM-FPD_CLIENT-1-UPGRADE_COMPLETE : FPD upgrade complete for
DbIoFpga@0/RP0/CPU0 [image upgraded to version 14.00]
Router:fpd_client[385]: %PLATFORM-FPD_CLIENT-1-UPGRADE_COMPLETE : FPD upgrade complete for
IoFpga@0/RP0/CPU0 [image upgraded to version 14.00]
Router:fpd_client[385]: %PLATFORM-FPD_CLIENT-1-UPGRADE_COMPLETE : FPD upgrade complete for
x86Fpga@0/RP0/CPU0 [image upgraded to version 254.00]
Router:shelfmgr[459]: %PLATFORM-SHELFMGR-6-INFO_LOG : 0/RP0/CPU0 is operational
Router:fpd-serv[265]: %INFRA-FPD_Manager-1-UPGRADE_ALERT : FPD Upgrade Completed (use "show hw-module
fpd" to check upgrade status)

```

Upgrades all the current FPD images that must be upgraded on the specified card with new images.

Before continuing to the next step, wait for confirmation that the FPD upgrade has successfully completed. Status messages, similar to these, are displayed to the screen until the FPD upgrade is completed:

```

FPD upgrade started.
FPD upgrade in progress..
FPD upgrade in progress..
FPD upgrade sent to location xxxx
FPD upgrade sent to location yyyy
FPD upgrade in progress..
FPD upgrade finished for location xxx
FPD upgrade in progress..
FPD upgrade finished for location yyyy
FPD upgrade completed.

```

The “FPD upgrade in progress.” message is printed every minute. These logs are information logs, and as such, are displayed if the **logging console informational** command is configured.

If Ctrl-C is pressed while the FPD upgrade is in progress, the following warning message is displayed:

```

FPD upgrade in progress on some hardware,
aborting now is not recommended as it might
cause HW programming failure and result in
RMA of the hardware.
Do you want to continue? [Confirm(y/n)]

```

If you confirm that you want to abort the FPD upgrade procedure, this message is displayed:

```

FPD upgrade process has been aborted, please
check the status of the hardware and reissue
the upgrade command if required.

```

Note

- If your card supports multiple FPD images, you can use the **show fpd package** admin command to determine what specific image to upgrade in the **upgrade hw-module fpd** command.
- A message is displayed when router modules cannot get upgraded during upgrade with **location all** option indicating that the FPGA is intentionally skipped during upgrade. To upgrade such FPGAs, you can use the CLI command with a particular location explicitly specified. For example, **upgrade hw-module fpd all location 0/3/1**.
- It is recommended to upgrade all FPGAs on a given node using the **upgrade hw-module fpd all location {all | node-id}** command. Do not upgrade the FPGA on a node using the **upgrade hw-module fpd <individual-fpd> location {all | node-id}** as it may cause errors in booting the card.

Step 4 **hw-module location { node-id | all } reload**

Use the **hw-module location reload** command to reload a line card.

```
Router:ios(config)# hw-module location 0/3 reload
```

Step 5 **exit**

Step 6 **show hw-module fpd**

Verifies that the FPD image on the card has been successfully upgraded by displaying the status of all FPDs in the system.

Example:


```
Router# show hw-module fpd
```

```
Auto-upgrade:Disabled
```

```
Attribute codes: B golden, P protect, S secure, A Anti Theft aware
```

```

                                FPD Versions
                                =====
Location   Card type           HWver FPD device   ATR Status   Running Programd   Reload Loc
-----
0/RP0/CPU0 8201           0.30 Bios          NEED UPGD    7.01             7.01           0/RP0/CPU0
0/RP0/CPU0 8201           0.30 BiosGolden    B  NEED UPGD    7.01             7.01           0/RP0/CPU0
0/RP0/CPU0 8201           0.30 IoFpga          NEED UPGD    7.01             7.01           0/RP0
0/RP0/CPU0 8201           0.30 IoFpgaGolden    B  NEED UPGD    7.01             7.01           0/RP0
0/RP0/CPU0 8201           0.30 SsdIntelS3520    NEED UPGD    7.01             7.01           0/RP0
0/RP0/CPU0 8201           0.30 x86Fpga          NEED UPGD    7.01             7.01           0/RP0
0/RP0/CPU0 8201           0.30 x86FpgaGolden    B  NEED UPGD    7.01             7.01           0/RP0
0/RP0/CPU0 8201           0.30 x86TamFw          NEED UPGD    7.01             7.01           0/RP0
0/RP0/CPU0 8201           0.30 x86TamFwGolden    B  NEED UPGD    7.01             7.01           0/RP0
0/PM0      PSU2KW-ACPI          0.0 PO-PrimMCU        NEED UPGD    7.01             7.01           NOT REQ
0/PM1      PSU2KW-ACPI          0.0 PO-PrimMCU        NEED UPGD    7.01             7.01           NOT REQ

```

If the cards in the system do not meet the minimum requirements, the output contains a “NOTES” section that states how to upgrade the FPD image.

Table 1: show hw-module fpd Field Descriptions

Field	Description
Card Type	Module part number.
HW Version	Hardware model version for the module.
Type	Hardware type. <ul style="list-style-type: none"> lc—Line card
Subtype	FPD type. Can be one of the following types: <ul style="list-style-type: none"> Bios - Basic Input/Output System BiosGolden - Golden BIOS image IoFpga - Input/Output Field-Programmable Gate Array IoFpgaGolden - Golden IoFpga SsdIntelS3520 - Solid State Drive, made by Intel, of the model series S3520 x86Fpga - Field-Programmable Gate Array designed to work with x86-based systems x86FpgaGolden - Golden image of x86Fpga x86TamFw - x86 Tam firmware x86TamFwGolden - Golden image of x86TamFw PO-PrimMCU - Primary microcontroller unit associated with a 'PO'
Inst	FPD instance. The FPD instance uniquely identifies an FPD and is used by the FPD process to register an FPD.

Field	Description
Current SW Version	Currently running FPD image version.
Upg/Dng?	Specifies whether an FPD upgrade or downgrade is required. A downgrade is required in rare cases when the version of the FPD image has a higher major revision than the version of the FPD image in the current Cisco IOS XR software package.

Automatic Line Card Reload on FPD Upgrade

This feature automatically reloads a newly inserted line card (LC) after a successful FPD upgrade. The prior auto FPD upgrade process did not reload the line card automatically, the user had to manually reload the LC.

Restrictions for Automatic Line Card Reload on FPD Upgrade

The following restriction must be considered while configuring automatic line card reload on FPD upgrade:

- If the FPD upgrade fails on a line card then the automatic line card reload feature (if enabled) stops the LC from reloading.

Configure Automatic Line Card Reload on FPD Upgrade

The following sample shows how to configure auto-reload feature:

```
Router# config
Router(config)#fpd auto-upgrade enable
Router(config)#fpd auto-reload enable
Router(config)#commit
```

The auto-reload feature is only supported on line cards.



Note During the FPD upgrade process, the linecard may display IOS XR RUN state before triggering auto-reload.

Types of Power Module Upgrade

In Cisco IOS XR Routers, Field Programmable Device (FPD) upgrades for power modules are used to update the firmware or hardware logic of power entry modules (PEMs) within the router. These upgrades ensure that power modules operate effectively with the latest enhancements and bug fixes. There are two main types of FPD upgrades for power modules:

- [Manual Power Module FPD Upgrade](#)
- [Parallel Power Module FPD Upgrade, on page 12](#)

Manual Power Module FPD Upgrade

Manual Power modules FPD upgrades are supported on Cisco Routers and should be performed in Config mode only. This feature lets you perform FPD upgrades on individual Power Entry Modules (PEMs) rather than initiating a [Parallel Power Module Upgrade](#).

Only power modules that support FPD upgrades can be upgraded manually.



Note Power module upgrades are time consuming and can't be implicitly upgraded or as a part of automatic FPD upgrades. These modules must be upgraded independent of the other fpga upgrades.

To determine which PEMs requires upgrade, use **show hw-module location all fpd**.

PEMs requiring upgrade are in **UPGD SKIP** status.

```
Router#show hw-module location all fpd
```

```
Auto-upgrade:Disabled
```

```
Attribute codes: B golden, P protect, S secure, A Anti Theft aware
```

					FPD Versions	
					=====	
Location	Card type	HWver	FPD device	ATR Status	Running Programd	
Reload Loc						
0/RP0/CPU0 8201		0.30	Bios	NEED UPGD	7.01	7.01
0/RP0/CPU0						
0/RP0/CPU0 8201		0.30	BiosGolden	B NEED UPGD		7.01
0/RP0/CPU0						
0/RP0/CPU0 8201		0.30	IoFpga	NEED UPGD	7.01	7.01
0/RP0						
0/RP0/CPU0 8201		0.30	IoFpgaGolden	B NEED UPGD		7.01
0/RP0						
0/RP0/CPU0 8201		0.30	SsdIntelS3520	NEED UPGD	7.01	7.01
0/RP0						
0/RP0/CPU0 8201		0.30	x86Fpga	NEED UPGD	7.01	7.01
0/RP0						
0/RP0/CPU0 8201		0.30	x86FpgaGolden	B NEED UPGD		7.01
0/RP0						
0/RP0/CPU0 8201		0.30	x86TamFw	NEED UPGD	7.01	7.01
0/RP0						
0/RP0/CPU0 8201		0.30	x86TamFwGolden	B NEED UPGD		7.01
0/RP0						
0/PM0	PSU2KW-ACPI	0.0	PO-PrimMCU	NEED UPGD	7.01	7.01
NOT REQ						
0/PM1	PSU2KW-ACPI	0.0	PO-PrimMCU	NEED UPGD	7.01	7.01
NOT REQ						

To upgrade the power modules manually, use **[config] upgrade hw-module location 0/PT/location fpd <fpd_device>**.

```
Router# config
```

```
Router(config)# upgrade hw-module location 0/PT0 fpd PM0-DT-Pri0MCU
```

To force a power module upgrade, use **upgrade hw-module fpd all force location pm-all** command in Config mode.

Parallel Power Module FPD Upgrade

Power modules can now be upgraded in parallel on Cisco 8000 Series Routers. This feature lets you perform FPD upgrades on multiple power modules simultaneously.

Parallel upgrade process reduces the overall time required to upgrade a full chassis with many power modules. Only power modules that support FPD upgrades can be upgraded in parallel.

To upgrade the power modules in parallel, use **upgrade hw-module location pm-all fpd all** or **upgrade hw-module fpd all location pm-all** command in Config mode.

Pre-requisites to Perform Parallel Upgrade

- Ensure that all power connections to the power supply are energized. To verify the power supply details, use **show environment power-supply** command in Config mode.

For more information on these commands, see *Hardware Redundancy and Node Administration Commands* chapter in *System Management Command Reference for Cisco 8000 Series Routers*.

- Ensure power available to the power supply is equal to the rated power. For example, 6KW power module must have a 6KW power feed. If the power feed to the power supply is less, the excess power calculation will be incorrect and the chassis may run out of power during an upgrade and suffer a sudden shutdown.
- Ensure sufficient or excess power is available in the chassis before you start the upgrade process.
- Do not add or remove any component (Line cards, RPs, power connections) from the chassis during an upgrade. This may cause power failure in the system due to sudden change in power in the system.



Note

- Power module upgrades are time consuming and cannot be implicitly upgraded or as a part of automatic FPD upgrades. These modules must be upgraded independent of the other fpga upgrades.
- The system upgrades the power modules in random order.
- The number of modules that can be upgraded simultaneously depends on the excess power available to the chassis.
- Ensure you initiate the parallel upgrade process only when all the pre-requisites are satisfied because the upgrade process cannot be aborted in between.

Performing Parallel Power Module Upgrade

To initiate a parallel upgrade process and upgrade all the power modules in the chassis simultaneously, use **pm-all** keyword in the **upgrade hw-module fpd** command in Config mode.

Example

The following section illustrates parallel power module upgrade implementation:

```
Router#upgrade hw-module location pm-all fpd all force
upgrade command issued (use "show hw-module fpd" to check upgrade status)

Router: upgrade_fpd_ng[67153]: Upgrade triggered by user(cisco) on pm_all for fpd (all)
with force(true)
Router: fpd-serv[415]: %PKT_INFRA-FM-3-FAULT_MAJOR : ALARM_MAJOR : FPD-NEED-UPGRADE : DECLARE
:0/PM0:
```

```

Router: fpd-serv[415]: %PKT_INFRA-FM-3-FAULT_MAJOR : ALARM_MAJOR : FPD-NEED-UPGRADE : DECLARE
:0/PM1:
Router: fpd-serv[415]: %INFRA-FPD_Manager-1-UPGRADE_ALERT : Upgrade for the following FPDs
has been committed:
Router: fpd-serv[415]: %INFRA-FPD_Manager-1-UPGRADE_ALERT : Location          FPD name
Force
Router: fpd-serv[415]: %INFRA-FPD_Manager-1-UPGRADE_ALERT :
=====
Router: fpd-serv[415]: %INFRA-FPD_Manager-1-UPGRADE_ALERT : 0/PM1          DT-PrimMCU
TRUE
Router: fpd-serv[415]: %INFRA-FPD_Manager-1-UPGRADE_ALERT : 0/PM0          DT-PrimMCU
TRUE
Router: fpd_client[348]: %PLATFORM-FPD_CLIENT-1-UPGRADE_CHILD_ALERT : Replicate upgrade
progress for child FPD SecMCU@0/PM0 from parent FPD DT-PrimMCU
Router: fpd_client[348]: %PLATFORM-FPD_CLIENT-1-UPGRADE_CHILD_ALERT : Replicate upgrade
progress for child FPD SecMCU@0/PM1 from parent FPD DT-PrimMCU
Router: envmon[157]: %PKT_INFRA-FM-3-FAULT_MAJOR : ALARM_MAJOR : Power Group Redundancy lost
:DECLARE :0:
Router: npu_drvr[291]: %FABRIC-NPU_DRV-3-ANLT_CONFIG_REQUIRED : [4899] : Port(s) require
auto negotiation (ANLT) config: port[_subport]: 3, 5, 9, 11, 13, 15, 17, 19, 21, 23, 25,
27, 29, 33, 34, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, total: 26.
Router: fpd_client[348]: %PLATFORM-FPD_CLIENT-1-UPGRADE_COMPLETE : FPD upgrade complete for
PrimMCU@0/PM0 [image upgraded to version 3.01]
Router: fpd_client[348]: %PLATFORM-FPD_CLIENT-1-UPGRADE_COMPLETE : FPD upgrade complete for
SecMCU@0/PM0 [image upgraded to version 3.01]
Router: fpd-serv[415]: %PKT_INFRA-FM-3-FAULT_MAJOR : ALARM_MAJOR : FPD-NEED-UPGRADE : CLEAR
:0/PM0:
Router: fpd_client[348]: %PLATFORM-FPD_CLIENT-1-UPGRADE_COMPLETE : FPD upgrade complete for
PrimMCU@0/PM1 [image upgraded to version 3.01]
Router: fpd_client[348]: %PLATFORM-FPD_CLIENT-1-UPGRADE_COMPLETE : FPD upgrade complete for
SecMCU@0/PM1 [image upgraded to version 3.01]
Router: fpd-serv[415]: %PKT_INFRA-FM-3-FAULT_MAJOR : ALARM_MAJOR : FPD-NEED-UPGRADE : CLEAR
:0/PM1:
Router: envmon[157]: %PKT_INFRA-FM-3-FAULT_MAJOR : ALARM_MAJOR : Power Group Redundancy lost
:CLEAR :0:
Router: fpd-serv[415]: %INFRA-FPD_Manager-1-UPGRADE_ALERT : FPD Upgrade Completed (use
"show hw-module fpd" to check upgrade status)

```

Verification

Use **show hw-module fpd** command to verify the upgrade:

```
Router#show hw-module fpd
```

Auto-upgrade:Enabled,PM excluded

Attribute codes: B golden, P protect, S secure, A Anti Theft aware

Location	Card type	HWver	FPD device	ATR	Status	Running Programd	FPD Versions =====
Reload Loc							
0/RP0/CPU0	8212-48FH-M	0.4	Bios	S	CURRENT	1.09	1.09
0/RP0/CPU0	8212-48FH-M	0.4	BiosGolden	BS	CURRENT		1.01
0/RP0/CPU0	8212-48FH-M	0.4	DbIoFpga		CURRENT	1.00	1.00
0/RP0							
0/RP0/CPU0	8212-48FH-M	0.4	DbIoFpgaGolden	B	CURRENT		1.00
0/RP0							
0/RP0/CPU0	8212-48FH-M	0.4	IoFpga		CURRENT	1.00	1.00
0/RP0							
0/RP0/CPU0	8212-48FH-M	0.4	IoFpgaGolden	B	CURRENT		1.00
0/RP0							
0/RP0/CPU0	8212-48FH-M	0.4	SsdMicron5300	S	CURRENT	0.01	0.01
0/RP0							

0/RP0/CPU0	8212-48FH-M	0.4	x86Fpga	S	CURRENT	1.07	1.07
0/RP0							
0/RP0/CPU0	8212-48FH-M	0.4	x86FpgaGolden	BS	CURRENT		1.07
0/RP0							
0/RP0/CPU0	8212-48FH-M	0.4	x86TamFw	S	CURRENT	7.12	7.12
0/RP0							
0/RP0/CPU0	8212-48FH-M	0.4	x86TamFwGolden	BS	CURRENT		7.12
0/RP0							
0/PM0	PSU3KW-HVPI	1.0	DT-PrimMCU		CURRENT	3.01	3.01
NOT REQ							
0/PM0	PSU3KW-HVPI	1.0	DT-SecMCU		CURRENT	3.01	3.01
NOT REQ							
0/PM1	PSU3KW-HVPI	1.0	DT-PrimMCU		21% UPGD	3.01	
NOT REQ							
0/PM1	PSU3KW-HVPI	1.0	DT-SecMCU		21% UPGD	3.01	
NOT REQ							
0/FB0	8212-48FH-M[FB]	1.0	IoFpga		CURRENT	1.10	1.10
NOT REQ							
0/FB0	8212-48FH-M[FB]	1.0	IoFpgaGolden	B	CURRENT		1.00
NOT REQ							