Upgrading FPD

In general terms, *field-programmable devices* (FPDs) are hardware devices implemented on router cards that support separate software upgrades. A *field-programmable gate array* (FPGA) is a type of programmable memory device that exists on most hardware components of the router. The term *FPD* has been introduced to collectively and generically describe any type of programmable hardware device on FPGAs. Cisco IOS XR software provides the Cisco FPD upgrade feature to manage the upgrade of FPD images .

For complete descriptions of the FPD commands listed in this module, see .

Table 1: Feature History for Upgrading FPD Software on Cisco IOS XR Software

Release	Modification
Release 5.0.0	This feature was introduced.
Release 6.4.1	Support for parallel FPD upgrade for power modules.

This module contains the following topics:

FPD

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.

Prerequisites for FPD Image Upgrades

Before upgrading the FPD on your router you must install and activate the fpd.rpm package.

This is for the manual upgrade using the **upgrade hw-module FPD** command.

Overview of FPD Image Upgrade Support

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

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.

Related Topics

show hw-module fpd Command Output: Example

Automatic FPD Upgrade

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.

FPD upgrade service

The main tasks of the FPD upgrade service are:

- FPD image version checking to decide if a specific firmware image needs an upgrade or not.
- Automatic FPD Image Upgrade (if enabled).
- 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.

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.

Determining Upgrade Requirement

Use the **show hw-module fpd** command to determine if an FPD upgrade is required. Check for NEED UPGD in the Status column.

Use the **show fpd package** command to find out which FPGAs are supported with your current software release and minimum hardware requirements for each module.

Automatic FPD upgrade

Use the **fpd auto-upgrade enable** command to enable the auto upgrade feature.

The FPD images are upgraded as part of the install activation of the new image. The FPDs are upgraded before the router is reloaded.

During an FPD auto-upgrade, the installed FPD rpm package includes an FPD image with a new version of software that is different than the version of the image running on the hardware. Once the FPDs have been upgraded, even if the base image is rolled backed to the older version, the FPD will not be downgraded to its previous version.

When a reload package is installed with new FPD images, the FPD images are upgraded before the router gets reloaded. This feature is controlled through an fpd auto-upgrade configuration option. The auto-upgrade feature does not address the following:

- FPD Upgrade during initial boot

- FPD Upgrade during new card insertion

Manual FPD upgrade

Manual FPD upgrade is performed using the **upgrade hw-module fpd** command. All cards or all of FPGA in a card can be upgraded. If reload is required to activate FPD , the upgrade should be complete. All line-cards, fabric cards and RP cards cannot 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 upgrade(s)

The **force** option can be used to forcibly upgrade the FPD (regardless of whether it is 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.

> **Note**   In some cases, FPDs can have primary and backup images.

FPD upgrade

The key to understanding the FPD output is that nodes can have two firmware versions. One, which is currently running, and a downloaded version, which will become the running version after the next boot. The running version and downloaded version can be the same. There are circumstances where this is not the case, and that would be if a node was recently upgraded, and requires a reboot to load the new updated package. Generally, the downloaded version is the latest version, when compared to the running version. FPD packages that do not require a reload to activate the new firmware version would not see the version skew. Below is a sample output showing version skew on the CCC FPGA. After reload, both running and downloaded versions will be the same. CCC Power-On is in need of an upgrade. To see what version is expected, issue the command **show fpd package** and find the FPD device for that card type which is in need of upgrade.

```
show hw-module fpd
                                                            FPD Versions
                                                       ================
Location      Card type       HWver   FPD device       Status     Running Download
-------------------------------------------------------------------------------
0/0           NC6-10X100G-L 0.6       CCC FPGA         UPGD DONE  1.13    1.14
0/0           NC6-10X100G-L 0.6       BAO-MB FPGA      READY      1.00    1.00
0/0           NC6-10X100G-L 0.6       CCC Power-On     NEED UPGD  1.28    1.28
0/0           NC6-10X100G-L 0.6       Ethernet Switch  READY      1.32    1.32
0/0           NC6-10X100G-L 0.6       BIOS FPD         READY      9.10    9.10
0/0           NC6-10X100G-L 1.0       Slice-0 GN2411   READY      2.07    2.07
0/0           NC6-10X100G-L 1.0       Slice-1 GN2411   READY      2.07    2.07
0/0           NC6-10X100G-L 0.6       BAO-DB FPGA      READY      1.00    1.00
0/0           NC6-10X100G-L 1.0       S2 GN2411        READY      2.07    2.07
0/0           NC6-10X100G-L 1.0       S3 GN2411        READY      2.07    2.07
0/0           NC6-10X100G-L 1.0       S4 GN2411        READY      2.07    2.07
show fpd package
Mon Oct  7  18:08:21.994 UTC


=============================== ====================================================
                                 Field Programmable Device Package
                                ====================================================
                                            Req     SW       Min Req   Min Req
Card Type              FPD Description       Reload  Ver      SW Ver    Board Ver
==================== ========================= ====== ======= ======== =========
P-L-1xPAT_SFP          BAO-MB FPGA           NO      0.20     0.20      0.0
                       CCC FPGA              YES     1.14     1.14      0.0
                       CCC Power-On          YES     1.30     1.30      0.0
                       Ethernet Switch       YES     1.32     1.32      0.0
                       BIOS FPD              YES     9.10     9.10      0.0
                       SB Certificates       NO      1.00     1.00      0.0
```

To upgrade an fpd device, such as the one above, use the **upgrade hw-module location 0/0 fpd CCC\ Power-On** command or if it is more desirable to upgrade all components that need upgrading at the same time, use the **upgrade hw-module location all fpd all** command. Note that this upgrade will require a reload of the node to take effect. Adding the force option will upgrade all FPD devices regardless if they require upgrading or not. This is not recommended.

The command used for upgrade is: **upgrade hw-module location** *location of node* **fpd** *fpd device*

The **show fpd package** command displays 4 very critical pieces of information with regard to firmware that is imbedded in the current running XR image. The first column displays whether a reload would be required to make the updated FPD version the running version. The second column shows the version number of firmware residing on the running XR image. The forth and fifth columns show, based on the current running XR image, what the minimum requirements are for both firmware and hardware versions for each programmable device.

Additional References

The following sections provide references related to FPD software upgrade.

Related Documents

Related Topic	Document Title
Cisco IOS XR command master list	
Cisco IOS XR FPD upgrade-related commands	*System Management Command Reference for Cisco NCS 6000 Series Routers*
Initial system bootup and configuration information for a router using the Cisco IOS XR Software.	
Information about user groups and task IDs	*Configuring AAA Services on* module of *System Security Configuration Guide for Cisco NCS 6000 Series Routers*

Standards

Standards	Title
No new or modified standards are supported by this feature, and support for existing standards has not been modified by this feature.	—

MIBs

MIBs	MIBs Link
There are no applicable MIBs for this module.	To locate and download MIBs for selected platforms using Cisco IOS XR Software, use the Cisco MIB Locator found at the following URL: http://cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml

RFCs

RFCs	Title
No new or modified RFCs are supported by this feature, and support for existing RFCs has not been modified by this feature.	—

Technical Assistance

Description	Link
The Cisco Technical Support website contains thousands of pages of searchable technical content, including links to products, technologies, solutions, technical tips, and tools. Registered Cisco.com users can log in from this page to access even more content.	http://www.cisco.com/cisco/web/support/index.html