Upgrading Field-Programmable Devices

In general terms, field-programmable devices (FPDs) are hardware devices implemented on router cards that support separate upgrades. The term FPD has been introduced to collectively and generically describe any type of programmable hardware device on Ethernet Line Cards. FPDs were introduced on the Cisco ASR 1000 Series Aggregation Services Routers to support the Ethernet Line Cards.

This chapter describes the information that you need to verify the image versions and to perform Ethernet Line Card FPD upgrades.

This chapter includes the following sections:

Release History

Table 5-1 provides the release history for all FPD-related features on the Cisco ASR 1000 Series Aggregation Services Routers.

Table 1: FPD Release History

Release	Modification
Cisco IOS XE Release 3.10S	Initial release of the Ethernet Line Card FPD image for the ASR1000-2T+20X1GE Line Card.
Cisco IOS XE Release 3.11S	—
Cisco IOS XE Release 3.12S	Initial release of Ethernet Line Card FPD image for the ASR1000-6TGE Line Card.

FPD Upgrade

This section provides information to help you upgrade FPDs for Ethernet Line Cards.

Note	The instructions provided in this section are not always feasible for all the operating network environments.

This section contains the following topics:

Overview of FPD Images and Packages

The Cisco IOS image comes bundled with the FPD image in the Cisco ASR 1000 Series Aggregation Services Routers. In an Ethernet Line Card FPD incompatibility disables all the interfaces on that Ethernet Line Card until the incompatibility is addressed.

Upgrading Your Cisco IOS Release and FPD Image

To upgrade your Cisco IOS release and FPD image, perform the following steps:

SUMMARY STEPS

1. Download the Ethernet Line Card package for the Cisco IOS release that you are upgrading to. The package contains both the Cisco IOS image and the FPD image.
2. Boot the new version of Cisco IOS.
3. When the new version of Cisco IOS boots, search for the bundled FPD image. The FPD images will be updated automatically as part of the Cisco IOS boot process.
4. After the router has booted, verify that the upgrade was successful by entering the show hw-module all fpd command.

DETAILED STEPS

Step 1	Download the Ethernet Line Card package for the Cisco IOS release that you are upgrading to. The package contains both the Cisco IOS image and the FPD image.
Step 2	Boot the new version of Cisco IOS.
Step 3	When the new version of Cisco IOS boots, search for the bundled FPD image. The FPD images will be updated automatically as part of the Cisco IOS boot process.
Step 4	After the router has booted, verify that the upgrade was successful by entering the show hw-module all fpd command.

Upgrading Only Your Cisco IOS Release and Retaining Your Current FPD Image

You can choose to upgrade your Cisco IOS release with or without retaining your current FPD image. Alternatively, you can choose to upgrade your Cisco IOS image and retain your current FPD image, although this is not recommended.

SUMMARY STEPS

1. Use the no upgrade fpd auto command to disable the bundled FPD image. This disables the Auto Upgrade feature.

2. Save the configuration.

3. Load the new image.

DETAILED STEPS

Step 1 Use the no upgrade fpd auto command to disable the bundled FPD image. This disables the Auto Upgrade feature.

Step 2 Save the configuration.

Step 3 Load the new image.

Note If your current FPD image is not compatible with the new image, the Ethernet Line Cards do not come online.

Upgrading FPD Images in a Production System

Adding an Ethernet Line Card to a production system presents the possibility that the Ethernet Line Card may contain versions of FPD images that are incompatible with the Cisco IOS release currently running on the router. In addition, the FPD upgrade operation can be a very CPU-intensive operation and therefore, the upgrade operation may take more time when it is performed on a production system. The performance impact will vary depending on various factors, including network traffic load, the type of processing engine used, type of Ethernet Line Card, and the type of service configured.

For these reasons, we recommend that one of the following alternatives be used to perform the FPD upgrade on a production system if possible:

Using a Nonproduction System to Upgrade the Cisco ASR 1000 Series Aggregation Services Routers Ethernet Line Card FPD Image

Before beginning the upgrade, ensure that:

- The spare system is running the same version of the Cisco IOS software release that the target production system is running.
- The Automatic Upgrade feature is enabled on the spare system. (The Automatic Upgrade feature is enabled by default. It can also be enabled using the **upgrade fpd auto** command).

Perform the following procedure to carry out an upgrade on the spare system:

SUMMARY STEPS

1. Insert the Ethernet Line Card into the spare system.

2. Verify that the upgrade was successful by entering the **show hw-module all fpd** command.

3. Remove the Ethernet Line Card from the spare system after the upgrade.

4. Insert the Ethernet Line Card into the target production system.

DETAILED STEPS

Step 1 Insert the Ethernet Line Card into the spare system.

If an upgrade is required, the system will perform the necessary FPD image updates so that when this Ethernet Line Card is inserted to the target production system it will not trigger an FPD upgrade operation there.

Step 2   Verify that the upgrade was successful by entering the **show hw-module all fpd** command.

Step 3   Remove the Ethernet Line Card from the spare system after the upgrade.

Step 4   Insert the Ethernet Line Card into the target production system.

Verifying System Compatibility

If a spare system is not available to perform an upgrade, you can check for system compatibility by disabling the Automatic Upgrade feature before inserting the Ethernet Line Card. (The Automatic Upgrade feature is enabled by default. It can be disabled by using the **no upgrade fpd auto** command.)

If the FPD images on the Ethernet Line Card are compatible with the system, you will only need to re-enable the Automatic Upgrade feature using the **upgrade fpd auto** command.

Perform the following procedure to check the FPD images on the Ethernet Line Card for system compatibility:

SUMMARY STEPS

1. Disable the Automatic Upgrade feature using the **no upgrade fpd auto** global configuration command.
2. Insert the Ethernet Line Card into the system.
3. Re-enable the Automatic Upgrade feature using the **upgrade fpd auto** command in the global configuration mode.

DETAILED STEPS

Step 1   Disable the Automatic Upgrade feature using the **no upgrade fpd auto** global configuration command.

Step 2   Insert the Ethernet Line Card into the system.

If the FPD images are compatible, the Ethernet Line Card will operate successfully after bootup.

If the FPD images are not compatible, the Ethernet Line Card is disabled. At this point, we recommend that you wait for a scheduled maintenance during which the system will be offline, to manually perform the FPD upgrade, as described in the Manually Upgrading Ethernet Line Card FPD Images, on page 4.

Step 3   Re-enable the Automatic Upgrade feature using the **upgrade fpd auto** command in the global configuration mode.

Optional FPD Procedures

This section provides information about optional FPD-related functions. None of the topics discussed in this section are necessary for completing FPD upgrades, but may be useful in some FPD-related scenarios. It covers the following topics:

Manually Upgrading Ethernet Line Card FPD Images

To manually upgrade the current FPD version on an Ethernet Line Card, use the following command:

```
Router# upgrade hw-module subslot
[slot-number/subslot-number] fpd bundle [reload]
```

In this example, *slot-number* is the slot where the Ethernet Line Card is installed, *subslot-number* is the subslot number where the Ethernet Line Card is located, **fpd** indicates the type of upgrade required, **bundle** selects the bundled FPD package, and **reload** specifies that the Ethernet Line Card is automatically reloaded after the upgrade. Note that **subslot** *slot-number/subslot-number* is used to specify an Ethernet Line Card FPD upgrade.

⚠

Caution   The Ethernet Line Card will automatically be reloaded to complete the FPD upgrade.

⚠

Caution   An image upgrade may take a long time to be completed depending on the Ethernet Line Card.

Upgrading Multiple FPD Images

A single piece of hardware can contain multiple FPD images. The router can upgrade up to three FPD images simultaneously. However, only one FPD upgrade per router slot can occur at a time.

Users should note that some FPD images require the Ethernet Line Card to reload to be completed. Since the FPD upgrade process will perform this step automatically, users do not have to intervene. However, the other FPDs in the hardware of the specified slot will have to wait for this reload to be completed before their upgrade process begins.

With a manual upgrade, you must include the **reload** option to cause the Ethernet Line Card to reload automatically. See the description provided for the **upgrade hw-module subslot command earlier in this section.**

During an automatic upgrade, the router will upgrade as many FPDs as possible at a time. No user intervention is possible or necessary. The upgrade process will not stop until all the FPD images have been updated.

During manual upgrades, it is important to note that users can only specify upgrades for a single piece of hardware each time the **upgrade hw-module subslot** [*slot-number/subslot-number*] command is entered. The maximum of three simultaneous upgrades applies to manual upgrades as well. If you individually specify multiple manual FPD upgrades, only three FPDs can be upgraded simultaneously and that can only occur when the hardware is in different router slots. The FPD upgrade process will stop when all the FPDs for the specified hardware have been upgraded.

Displaying Current and Minimum Required FPD Image Versions

To display the current version of FPD images on the Ethernet Line Cards installed on your router, use the **show hw-module** *slot-number/subslot-number* | **all**] **fpd** command, where *slot-number* is the slot number where the Ethernet Line Card is installed, and *subslot-number* is the number of the Ethernet Line Card subslot where a target Ethernet Line Card is located. Entering the **all** keyword shows information pertaining to the hardware in all the router slots.

The following examples show the output when the **show** command is used.

The following sample shows that FPD versions on the Ethernet Line Cards in the system meet the minimum requirements.

For ASR1000-2T+20X1GE:

```
Router# show hw-module subslot all fpd
==== ===================== ====== ============================================
                           H/W    Field Programmable   Current   Min. Required
Slot Card Type             Ver.   Device: "ID-Name"    Version     Version
==== ===================== ====== ================== =========== ==============
3/0  BUILT-IN-2T+20X1GE     1.0   22-DB FPGA              1.13        1.13
==== ===================== ====== ============================================
```

For ASR1000-6TGE:

```
Router# show hw-module subslot all fpd
==== ===================== ====== ============================================
                           H/W    Field Programmable   Current   Min. Required
Slot Card Type             Ver.   Device: "ID-Name"    Version     Version
==== ===================== ====== ================== =========== ==============
3/0  BUILT-IN-6TGE          0.3   22-DB FPGA              1.9         1.8
==== ===================== ====== ============================================
```

This example shows the output when using the *slot-number*/*subslot-number* argument to identify a particular Ethernet Line Card:

```
Router# show hw-module subslot 1/0 fpd
==== ===================== ====== ============================================
                           H/W    Field Programmable   Current   Min. Required
Slot Card Type             Ver.   Device: "ID-Name"    Version     Version
==== ===================== ====== ================== =========== ==============
1/0  BUILT-IN-2T+20X1GE     1.0   22-DB FPGA              1.13        1.13
==== ===================== ====== ============================================
```

The output display in this example shows that the Shared Port Adapter in subslot 0/1 is disabled because one of the programmable devices does not meet the minimum version requirements:

```
Router# show hw-module all fpd
==== ===================== ====== ============================================
                           H/W    Field Programmable   Current   Min. Required
Slot Card Type             Ver.   Device: "ID-Name"    Version     Version
==== ===================== ====== ================== =========== ==============
 0/0 SPA-4XOC3-POS          1.0   1-I/O FPGA             3.4         3.4
---- --------------------- ------ ------------------ ----------- --------------
 0/1 SPA-2XT3/E3 <DISABLED> 1.0   1-ROMMON              2.12        2.12
                                  2-I/O FPGA             0.6         1.0     *
                                  3-E3 FPGA              1.0         1.4     *
                                  4-T3 FPGA              1.0         1.4     *
---- --------------------- ------ ------------------ ----------- --------------
 0/2 SPA-1X10GE-L-V2        1.0   1-10GE I/O FPGA        1.9         1.9
---- --------------------- ------ ------------------ ----------- --------------
 0/3 SPA-1X10GE-L-V2        1.0   1-10GE I/O FPGA        1.9         1.9
==== ===================== ====== ============================================
NOTES:
     - FPD images that are required to be upgraded are indicated with a '*'
       character in the "Minimal Required Version" field.
     - The following FPD image package file is required for the upgrade:
       asr1000-fpd-bundle.pkg
==== ===================== ====== ============================================
```

Displaying Information About the Default FPD Image Package

Use the **show upgrade fpd package default** command to find out which SPAs and Ethernet Line Cards are supported with your current Cisco IOS release, and which FPD image package you need for an upgrade.

```
Router#
show upgrade fpd package default
****************************************************************************
This Cisco IOS software image requires the following default FPD Image
Package for the automatic upgrade of FPD images (the package is available
from Cisco.com and is accessible from the Cisco Software Center page where
this IOS software image can be downloaded):
****************************************************************************
Version: 12.2(XN)
Package Filename: asr1000-fpd-bundle.pkg
      List of card type supported in this package:
                                                          Minimal
              No. Card Type                               HW Ver.
              ---- ------------------------------------- -------
     1) 4xT SERIAL SPA                            0.0
              2) 4xT SERIAL SPA                          2.0
              3) 1xCHSTM1 SPA                            0.0
              4) SPA-1XCHOC12/DS0                        0.0
              5) SPA-1XCHOC12/DS0                        0.0
              6) 1xCHOC48STM16 SPA                       2.0
              7) 2xCT3 SPA                               0.100
              8) 2xCT3 SPA                               0.200
              9) 4xCT3 SPA                               0.100
             10) 4xCT3 SPA                               0.200
             11) WMA SPA                                 0.165
             12) 2x10GE & 20x1GE eLC                     0.0
```

Verifying the FPD Image Upgrade Progress

You can use the **show upgrade fpd progress** command to view a snapshot of the upgrade progress while an FPD image upgrade is taking place. The following example shows the type of information this command displays:

```
Router# show upgrade fpd progress

FPD Image Upgrade Progress Table:

==== ================== =====================================================
                                                Approx.
                        Field Programmable      Time      Elapsed
     Slot Card Type     Device : "ID-Name"      Needed    Time      State
     ==== ================== ================== ========== ========== ===========
      3/0  BUILT-IN-2T+20X1GE  22-DB FPGA         00:01:00  00:00:23  Updating...
     ---- ------------------ ------------------ ----------- --------- -----------
      0/2  SPA-2XT3/E3         4-T3 FPGA          --:--:--   --:--:--  Waiting...
     ==== ================== =====================================================
```

FPD Image Upgrade Examples

This section provides examples of automatic and manual FPD image upgrades, and includes the following examples:

Automatic FPD Image Upgrade Example

The following example shows the output displayed when a SPA in slot 0 subslot 1 requires an FPD image upgrade and the **upgrade fpd auto** command is *enabled* . The required FPD image is automatically upgraded.

Note   Note that the FPD image of an Ethernet Line Card is also upgraded similarly.

```
*Nov 28 13:14:22.782: %FPD_MGMT-3-INCOMP_IMG_VER: Incompatible I/O FPGA (FPD ID=2) image
version detected for SPA-2XT3/E3 card in subslot 0/1. Detected version = 0.6, minimum
required version = 1.0. Current HW version = 1.0.
*Nov 28 13:14:22.783: %FPD_MGMT-5-UPGRADE_ATTEMPT: Attempting to automatically upgrade the
 FPD image(s) for SPA-2XT3/E3 card in subslot 0/1. Use 'show upgrade fpd progress' command
 to view the upgrade progress ...
*Nov 28 13:14:22.841: %FPD_MGMT-6-BUNDLE_DOWNLOAD: Downloading FPD image bundle for
SPA-2XT3/E3 card in subslot 0/1 ...
*Nov 28 13:14:22.981: %FPD_MGMT-6-UPGRADE_TIME: Estimated total FPD image upgrade time for
 SPA-2XT3/E3 card in subslot 0/1 = 00:01:00.
*Nov 28 13:14:22.983: %FPD_MGMT-6-UPGRADE_START: I/O FPGA (FPD ID=2) image upgrade in
progress for SPA-2XT3/E3 card in subslot 0/1. Updating to version 1.1. PLEASE DO NOT INTERRUPT
 DURING THE UPGRADE PROCESS (estimated upgrade completion time = 00:01:00) ...
*Nov 28 13:14:43.267: %FPD_MGMT-6-UPGRADE_PASSED: I/O FPGA (FPD ID=2) image in the SPA-2XT3/E3
 card in subslot 0/1 has been successfully updated from version 0.6 to version 1.0. Upgrading
 time = 00:00:20.285
*Nov 28 13:14:43.267: %FPD_MGMT-6-OVERALL_UPGRADE: All the attempts to upgrade the required
 FPD images have been completed for SPA-2XT3/E3 card in subslot 0/1. Number of
successful/failure upgrade(s): 1/0.
*Nov 28 13:14:43.268: %FPD_MGMT-5-CARD_POWER_CYCLE: SPA-2XT3/E3 card in subslot 0/1 is being
 power cycled for the FPD image upgrade to take effect.
```

Manual FPD Image Upgrade Example

In the following example, FPD for the BUILT-IN-2T+20X1GE in subslot 3/0 is upgraded manually from the bundled FPD image package file. The command excludes the optional keyword **reload to ensure** that the line card does not get automatically reloaded.

```
Router#upgrade hw-module subslot 0/3 fpd bundled
% The following FPD will be upgraded for BUILT-IN-2T+20X1GE (H/W ver = 1.1) in slot 3/0:
================== =========== =========== ============
Field Programmable   Current     Upgrade     Estimated
Device: "ID-Name"    Version     Version     Upgrade Time
================== =========== =========== ============
22-DB FPGA            1.0         1.1        00:01:00
================== =========== =========== ============
% NOTES:
  - Use 'show upgrade fpd progress' command to view the progress of the FPD upgrade.
  - You must reload the card after the upgrade. The FPD upgrade is not      finalized until
 the card is reloaded.
  - The output of 'show hw-module <target> fpd' will not reflect the upgraded FPD     version
 until the card is reloaded to finalize the upgrade.
% Are you sure that you want to perform this operation? [no]: yes
% Initiating the upgrade operation on the target card ...
  (Use "show upgrade fpd progress" command to see upgrade progress)
Router#
*Mar  4 16:13:17.230: %FPD_MGMT-6-UPGRADE_TIME: Estimated total FPD image upgrade time for
 BUILT-IN-2T+20X1GE card in slot 3/0 = 00:01:00.
*Mar  4 16:13:17.232: %FPD_MGMT-6-UPGRADE_START: I/O FPGA (FPD ID=2) image upgrade in
```

```
progress for BUILT-IN-2T+20X1GE card in slot 3/0. Updating to version 1.1. PLEASE DO NOT
INTERRUPT DURING THE UPGRADE PROCESS (estimated upgrade completion time = 00:01:00) ...
*Mar  4 16:13:42.909: %FPD_MGMT-6-UPGRADE_PASSED: I/O FPGA (FPD ID=2) image in the
BUILT-IN-2T+20X1GE card in slot 3/0 has been successfully updated from version 1.0 to version
 1.1. Upgrading time = 00:00:25.676
*Mar  4 16:13:42.909: %FPD_MGMT-6-OVERALL_UPGRADE: All the attempts to upgrade the required
 FPD images have been completed for BUILT-IN-2T+20X1GE card in subslot 3/0. Number of
successful/failure upgrade(s): 1/0.
```

In the following example, FPD for the 2-port T3/E3 SPA in subslot 0/3 is upgraded manually from the bundled FPD image package file. Since the command includes the optional keyword **reload**, the SPA automatically reloads and the new FPD image takes effect immediately. Note that the FPD image of an Ethernet Line Card is also upgraded similarly.

```
Router#upgrade hw-module subslot 0/3 fpd bundled reload
% The following FPD will be upgraded for SPA-2XT3/E3 (H/W ver = 1.1) in subslot 0/3:
        ================== =========== =========== ============
        Field Programmable   Current     Upgrade    Estimated
        Device: "ID-Name"    Version     Version   Upgrade Time
        ================== =========== =========== ============
        2-I/O FPGA             1.0         1.1       00:01:00
        ================== =========== =========== ============
% NOTES:
  - Use 'show upgrade fpd progress' command to view the progress of the FPD
    upgrade.
  - The target card will be automatically reloaded after the upgrade
    operation. This reload will interrupt normal operation of the card. If
    necessary, ensure that appropriate actions have been taken to redirect
    card traffic before starting the FPD upgrade.
% Are you sure that you want to perform this operation? [no]: yes
% Initiating the upgrade operation on the target card ...
  (Use "show upgrade fpd progress" command to see upgrade progress)
Router#
*Mar  4 16:15:22.862: %FPD_MGMT-6-UPGRADE_TIME: Estimated total FPD image upgrade time for
 SPA-2XT3/E3 card in subslot 0/3 = 00:01:00.
*Mar  4 16:15:22.864: %FPD_MGMT-6-UPGRADE_START: I/O FPGA (FPD ID=2) image upgrade in
progress for SPA-2XT3/E3 card in subslot 0/3. Updating to version 1.1. PLEASE DO NOT INTERRUPT
 DURING THE UPGRADE PROCESS (estimated upgrade completion time = 00:01:00) ...
*Mar  4 16:15:47.795: %FPD_MGMT-6-UPGRADE_PASSED: I/O FPGA (FPD ID=2) image in the SPA-2XT3/E3
 card in subslot 0/3 has been successfully updated from version 1.0 to version 1.1. Upgrading
 time = 00:00:24.931
*Mar  4 16:15:47.795: %FPD_MGMT-6-OVERALL_UPGRADE: All the attempts to upgrade the required
 FPD images have been completed for SPA-2XT3/E3 card in subslot 0/3. Number of
successful/failure upgrade(s): 1/0.
*Mar  4 16:15:47.796: %FPD_MGMT-5-CARD_POWER_CYCLE: SPA-2XT3/E3 card in subslot 0/3 is being
 power cycled for the FPD image upgrade to take effect.
```

Troubleshooting Problems with FPD Image Upgrades

This section contains information to help troubleshoot problems that may occur during the upgrade process.

It contains the following topics:

Power Failure or Removal of an Ethernet Line Card During an FPD Image Upgrade

These instructions should only be used if a previous upgrade attempt has failed due to an external reason such as a power failure or removal of an Ethernet Line Card or a SPA.

If the FPD upgrade operation is interrupted by a power failure or the removal of an Ethernet Line Card or a SPA, it could corrupt the FPD image. This corruption of the FPD image file makes the SPA or the Ethernet Line Card unusable by the router and the system displays the following messages when it tries to power up the SPA or the Ethernet Line Card:

> **Note**
> To find more information about FPD-related messages, see the system error messages guide pertaining to your Cisco IOS XE software release.

```
Nov.28 11:30:36:%SPA_OIR-3-RECOVERY_RELOAD:subslot 0/1:Attempting
recovery by reloading SPA
Nov.28 11:30:51:%SPA_OIR-3-HW_INIT_TIMEOUT:subslot 0/1
Nov.28 11:30:56:%SPA_OIR-3-RECOVERY_RELOAD:subslot 0/1:Attempting
recovery by reloading SPA
Nov.28 11:31:11:%SPA_OIR-3-HW_INIT_TIMEOUT:subslot 0/1
Nov.28 11:31:16:%SPA_OIR-3-RECOVERY_RELOAD:subslot 0/1:Attempting
recovery by reloading SPA
Nov.28 11:31:31:%SPA_OIR-3-HW_INIT_TIMEOUT:subslot 0/1
Nov.28 11:31:31:%SPA_OIR-3-SPA_POWERED_OFF:subslot 0/1:SPA 4xOC3 POS
SPA powered off after 5 failures within 600 seconds
```

The **show hw-module all fpd** command can be used to verify that a SPA or an Ethernet Line Card is using a corrupted FPD image. In this example, the SPA in slot 0/1 is corrupted.

```
Router# show hw-module all fpd
==== ===================== ====== ==============================================
                           H/W    Field Programmable   Current     Min. Required
Slot Card Type             Ver.   Device: "ID-Name"    Version     Version
==== ===================== ====== ================== =========== ==============
 0/2 SPA-8XOC12-POS        1.0    1-I/O FPGA             1.1         1.1
---- --------------------- ------ ------------------ ----------- --------------
 0/3 SPA-2X1GE-SYNCE       1.50   1-2xGE SYNCE I/O F    1.12        1.12
                                  2-2xGE SYNCE SPAMO    1.0         1.0
---- --------------------- ------ ------------------ ----------- --------------
 1/0 BUILT-IN-2T+20X1GE    1.1    22-DB FPGA            1.14        1.13
---- --------------------- ------ ------------------ ----------- --------------
 3/0 SPA-5X1GE-V2          1.2    1-GE I/O FPGA         1.10        1.10
---- --------------------- ------ ------------------ ----------- --------------
 3/3 SPA-4XOC3-POS-V2      1.0    1-I/O FPGA            1.1         1.1
---- --------------------- ------ ------------------ ----------- --------------
 4/0 SPA-1X10GE-L-V2       1.2    1-10GE I/O FPGA       1.9         1.9
---- --------------------- ------ ------------------ ----------- --------------
 4/1 SPA-1X10GE-L-V2       1.2    1-10GE I/O FPGA       1.9         1.9
---- --------------------- ------ ------------------ ----------- --------------
 5/0 BUILT-IN-6TGE         0.3    22-DB FPGA            1.9         1.8
==== ===================== ====== ==============================================
```

Performing an FPD Recovery Upgrade

The recovery upgrade procedure can only be performed on an Ethernet Line Card or a SPA that has been powered off by the system after it has failed all of the retries attempted to initialize the Ethernet Line Card or the SPA.

The following example displays the output of an attempt to perform a recovery upgrade before all the initialization retries have been attempted for the SPA in subslot 0/1.

Note Because a recovery upgrade is done at a more conservative speed, it may take more than the estimated upgrade time.

Note When the system asks Do you want to perform the recovery upgrade operation? Answer **y** to this question only if you have attempted an FPD upgrade that has failed due to a power failure or an Ethernet Line Card removal.Contact Cisco Technical Support, if you have not had a failed upgrade attempt due to a power failure or an Ethernet Line Card removal.

```
Nov.28 11:29:55:%SPA_OIR-3-RECOVERY_RELOAD:subslot 0/1:Attempting
recovery by reloading SPA
Nov.28 11:30:10:%SPA_OIR-3-HW_INIT_TIMEOUT:subslot 0/1
Nov.28 11:30:15:%SPA_OIR-3-RECOVERY_RELOAD:subslot 0/1:Attempting
recovery by reloading SPA
Nov.28 11:30:31:%SPA_OIR-3-HW_INIT_TIMEOUT:subslot 0/1
Router# upgrade hw-module subslot 0/1 fpd bundled
% Cannot get FPD version information for version checking. If a previous
upgrade attempt has failed for the target card, then a recovery upgrade
would be required to fix the failure.
% The following FPD(s) will be upgraded for SPA-4XOC3-POS (H/W ver =
1.0) in subslot 0/1:
    ================== =========== =========== ============
    Field Programmable   Current     Upgrade    Estimated
    Device:"ID-Name"     Version     Version   Upgrade Time
    ================== =========== =========== ============
    22-DB1-I/O FPGA          ?.?          3.4        00:00:50
    ================== =========== =========== ============
% Do you want to perform the recovery upgrade operation? [no]:y
% Cannot perform recovery upgrade operation because the target card is
not in a failed state. Please try again later.
```

When the following error message is displayed, you can perform the recovery upgrade:

```
Nov.28 11:31:31:%SPA_OIR-3-SPA_POWERED_OFF:subslot 0/1:SPA 4xOC3 POS SPA powered off after
 5 failures within 600 seconds
```

Note You must wait to see this error message before you attempt the upgrade.

Perform the manual FPD image upgrade method using the **upgrade hw-module subslot** command to recover from a corrupted image after the Ethernet Line Card has been powered off by the system. In this command, *slot-number* is the slot where the Ethernet Line Card is installed; *subslot-number* is always 0.

The following example displays the console output of a recovery upgrade operation:

```
Router# upgrade hw-module subslot 0/1 fpd bundled
% Cannot get FPD version information from SPA-4XOC3-POS in subslot 0/1.
  If a previous upgrade attempt on the target card was interrupted, then the
  corruption of FPD image might have prevented the card from coming online.
  If this is the case, then a recovery upgrade would be required to fix the
  failure.
(Hit ENTER to proceed with recovery upgrade operation) [confirm]
% The following FPD will be upgraded for SPA-4XOC3-POS (H/W ver = 1.0) in subslot 0/1:
    ================== =========== =========== ============
          Minimum Compatible
    Field   Programmable  Current     Required  Version Found
    Device:"ID-Name"      Version     Version   In The File
    ================== =========== =========== ============
    22-DB    FPGA         1.13        1.13        1.13
    ================== =========== =========== ============
% NOTES:
 - Use 'show upgrade fpd progress' command to view the progress of the FPD
     upgrade.
 - Upgrade or downgrade operation can only be performed with FPD images that have compatible
 version with the one defined for this IOS image. That is to have the same major version
number and with minor version number no lower than the one defined for Minimum Required
Version.
 - Since the target card is currently in disabled state, it will be
     automatically reloaded after the upgrade operation for the changes to
     take effect.
% Do you want to perform the recovery upgrade operation? [no]: y
% Starting recovery upgrade operation in the background ...
   (Use "show upgrade fpd progress" command to see upgrade progress)
Router#
*Nov 28 17:46:10.191:%FPD_MGMT-6-UPGRADE_TIME: Estimated total FPD image upgrade time for
SPA-4XOC3-POS card in subslot 0/1 = 00:00:50.
*Nov 28 17:46:10.233:%FPD_MGMT-6-UPGRADE_START: I/O FPGA (FPD ID=1) image upgrade in progress
 for SPA-4XOC3-POS card in subslot 0/1. Updating to version 3.4. PLEASE DO NOT INTERRUPT
DURING THE UPGRADE PROCESS (estimated upgrade completion time = 00:00:50) ...
*Nov 28 17:46:55.948:%FPD_MGMT-6-UPGRADE_PASSED: I/O FPGA (FPD ID=1) image in the
SPA-4XOC3-POS card in subslot 0/1 has been successfully updated from version ?.? to version
 3.4. Upgrading time = 00:00:45.715
*Nov 28 17:46:55.948:%FPD_MGMT-6-OVERALL_UPGRADE: All the attempts to upgrade the required
 FPD images have been completed for SPA-4XOC3-POS card in subslot 0/1. Number of
successful/failure upgrade(s): 1/0.
*Nov 28 17:46:55.949:%FPD_MGMT-5-CARD_POWER_CYCLE: SPA-4XOC3-POS card in subslot 0/1 is
being power cycled for the FPD image upgrade to take effect.
```

Verifying a Successful Upgrade

After the upgrade process is complete, use the **show hw-module all fpd** command to verify that the FPD image has been successfully upgraded:

```
Router# show hw-module subslot all fpd
==== ====================== ====== =============================================
                             H/W    Field Programmable   Current   Min. Required
Slot Card Type               Ver.   Device: "ID-Name"    Version      Version
==== ====================== ====== ================== =========== ==============
 0/2 SPA-8XOC12-POS          1.0    1-I/O FPGA            1.1          1.1
---- ---------------------- ------ ------------------ ----------- --------------
 0/3 SPA-2X1GE-SYNCE         1.50   1-2xGE SYNCE I/O F    1.12         1.12
                                    2-2xGE SYNCE SPAMO    1.0          1.0
---- ---------------------- ------ ------------------ ----------- --------------
 1/0 BUILT-IN-2T+20X1GE      1.1    22-DB FPGA            1.14         1.14
```

```
---- --------------------- ------ ----------------- ---------- --------------
3/0  SPA-5X1GE-V2          1.2    1-GE I/O FPGA     1.10       1.10
---- --------------------- ------ ----------------- ---------- --------------
3/3  SPA-4XOC3-POS-V2      1.0    1-I/O FPGA        1.1        1.1
---- --------------------- ------ ----------------- ---------- --------------
4/0  SPA-1X10GE-L-V2       1.2    1-10GE I/O FPGA   1.9        1.9
---- --------------------- ------ ----------------- ---------- --------------
4/1  SPA-1X10GE-L-V2       1.2    1-10GE I/O FPGA   1.9        1.9
---- --------------------- ------ ----------------- ---------- --------------
5/0  BUILT-IN-6TGE         0.3    22-DB FPGA        1.9        1.9
==== ===================== ====== ===========================================
```