Upgrading Field-Programmable Hardware Devices for Cisco 1000 Series ISRs

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CHAPTER 1

Upgrading Field-Programmable Hardware Devices for Cisco 1000 Series ISRs

From Cisco IOS XE Fuji 16.8.1 Release, Cisco 1000 Series Integrated Services Routers (ISRs) allow users to perform upgrades in the field on programmable hardware devices. Field-programmable hardware devices include the complex programmable logic device (CPLD). This document describes the procedures to perform an upgrade on a field-programmable hardware device.

- Feature Information for Upgrading Field-Programmable Hardware Devices for Cisco 1000 Series ISRs, on page 1
- Upgrading Field-Programmable Hardware Devices Overview, on page 2
- Displaying the CPLD Version, on page 2
- CPLD Field-Programmable Upgrade, Cisco IOS XE Fuji 16.8.1 Release, on page 3
- ROMMON Overview, on page 6
- Additional References, on page 9

Feature Information for Upgrading Field-Programmable Hardware Devices for Cisco 1000 Series ISRs

The following table provides release information about the feature or features described in this module. This table lists only the software release that introduced support for a given feature in a given software release train. Unless noted otherwise, subsequent releases of that software release train also support that feature.

Use Cisco Feature Navigator at www.cisco.com/go/cfn to find information about platform support and Cisco software image support. An account on Cisco.com is not required.
Table 1: Feature Information for Upgrading Field-Programmable Hardware Devices for Cisco 1000 Series ISRs

<table>
<thead>
<tr>
<th>Feature Name</th>
<th>Releases</th>
<th>Feature Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upgrading Field-Programmable Hardware Devices for Cisco 1000 Series ISRs</td>
<td>Cisco IOS XE Fuji 16.8.1 Release</td>
<td>In Cisco IOS XE Fuji 16.8.1 Release, support for upgrading field-programmable hardware devices was introduced for the Cisco 1000 Series ISRs. The following commands were introduced: <code>upgrade hw-programmable</code>, <code>show hw-programmable</code>, <code>show upgrade hw-programmable progress</code>, <code>show upgrade hw-programmable file</code>.</td>
</tr>
</tbody>
</table>

### Upgrading Field-Programmable Hardware Devices Overview

The hardware-programmable firmware is upgraded when Cisco 1000 Series ISR contains an incompatible version of the hardware-programmable firmware. To do this upgrade, a hardware-programmable firmware package is released to customers.

Generally, an upgrade is necessary only when a system message indicates one of the field-programmable devices on the Cisco 1000 Series ISR needs an upgrade, or a Cisco technical support representative suggests an upgrade.

From Cisco IOS XE Fuji 16.8.1 Release onwards, you must upgrade the CPLD firmware to support the incompatible versions of the firmware on the Cisco 1000 Series ISR. For upgrade procedures, see the CPLD Field Programmable Upgrade section.

⚠️ **Caution**

Do not power down the router during the field-programmable upgrade. Although, the Cisco 1000 Series ISR should be able to recover from most interruptions during the upgrade, certain scenarios may cause unpredictable problems.

### Displaying the CPLD Version

If you receive an error message indicating that the device needs an upgrade, and you have an incompatible CPLD version on the device, use the `show platform` command to display the status of your active Cisco 1000 Series ISR. The following example shows the output of the `show platform` command on a Cisco ISR 1000 Series Router:

```
Router# show platform
Chassis type: ISR4451-X/K9
Slot  Type       State         Insert time (ago)
-------- -------- ---------- --------------
 0       ISR4451-X/K9  ok          00:14:41
 0/0     ISR4451-X-4x1GE ok          00:14:06
 1       ISR4451-X/K9  ok          00:14:41
 2       ISR4451-X/K9  ok          00:14:41
 R0      ISR4451-X/K9  ok, active  00:14:41
 F0      ISR4451-X/K9  ok, active  00:14:41
 P0      Unknown     ps, fail     never
 P1      XXX-XXXX-XX  ok          00:14:26
```
### CPLD Field-Programmable Upgrade, Cisco IOS XE Fuji 16.8.1 Release

This section covers the following topics:

#### CPLD Field-Programmable Upgrade Overview

CPLD field-programmable upgrade can be performed on a need basis to address any specific issues with the hardware-programmable devices. The subsequent sections describe how to upgrade the Cisco 1000 Series ISRs.

To determine if one of the components has an incompatible CPLD version, use the show platform command. See the Displaying_the_CPLD_Version_106797 section.

From Cisco IOS XE Fuji 16.8.1 Release onwards, a hardware-programmable package is released to customers whose devices require a CPLD upgrade.

#### Downloading the Hardware-Programmable Firmware Package

To download the hardware programmable firmware package from Cisco.com, perform these steps:

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong></td>
<td>Log in to the Download Software page <a href="https://software.cisco.com/download/navigator.html">https://software.cisco.com/download/navigator.html</a>.</td>
</tr>
<tr>
<td><strong>Step 2</strong></td>
<td>From the Select a Software Product Category area, select &gt; <strong>Routers</strong> &gt; <strong>Branch Routers</strong> &gt; <strong>Cisco 1000 Series Integrated Services Routers</strong>, and select the appropriate router from the list.</td>
</tr>
<tr>
<td><strong>Step 3</strong></td>
<td>From the <strong>Select a Software Type</strong> area select <strong>IOS XE Hardware Programmable Devices</strong>.</td>
</tr>
<tr>
<td><strong>Step 4</strong></td>
<td>Click <strong>Download or Add to Cart</strong> the IOS XE Software hardware programmable firmware package and follow the prompts.</td>
</tr>
</tbody>
</table>

**Note**

A CPLD upgrade is necessary only when a system message indicates that the Cisco 1000 Series ISR needs an upgrade. Cisco 1000 Series ISRs are shipped with Cisco IOS XE 16.8(1r)S1 image pre-installed and that ROMMON upgrade is necessary only starting with Cisco IOS XE 16.8.1 Release.

#### Upgrading an Active Cisco 1000 Series ISRs

You can upgrade the CPLD firmware on Cisco 1000 Series ISRs using the upgrade hw-programmable command. The CPLD upgrade can take up to ten minutes for each component. You can perform the upgrade...
on the Cisco 4000 Series ISRs any time as long as you can access the privileged EXEC mode prompt on the router.

To upgrade a Cisco 1000 Series ISRs, perform these steps:

**Step 1**
Cold boot the active Cisco 1000 Series ISR.

**Step 2**
Copy the hardware-programmable upgrade package to your bootflash:

**Example:**

```
copy tftp:/...isr-hw-programmables.03.13.00.S.154-3.S-ext.SPA.pkg bootflash
```

**Step 3**
Run the hw-programmable cpld filename command from the EXEC mode:

**Example:**

```
Router#upgrade hw-programmable cpld filename
bootflash:isr-hw-programmables.03.13.00.S.154-3.S-ext.SPA.pkg R0
```

**Step 4**
If you are using Cisco IOS XE 16.8.1 Release or later, then skip to Step 5. At the system prompt, press Enter to start the upgrade:

**Example:**

```
Upgrade CPLD on Route-Processor 0 from current version 13041228 to 14061635 [Press Enter to confirm]

This command could take up to 10 minutes, please wait and do not power-cycle the chassis or the card. Otherwise, hardware may be unrecoverable. It is recommended that all cards are running the same version IOS-XE software prior to the upgrade. At the end of upgrade you will be asked to reload the chassis. [Press Enter to confirm]

Upgrade cpld hw-programmable on Route-Processor 0
The cpld has been successfully upgraded on Route-Processor/0.
PLEASE RELOAD THE CHASSIS NOW.
Router#
```

**Caution**
Do not power down or interrupt the router during the CPLD upgrade. Although, the Cisco 1000 Series ISR should be able to recover from most interruptions during the CPLD upgrade, certain scenarios may cause unpredictable problems.

**Example:**

```
a) From the IOS console, use the reload command to gracefully shutdown the system.
b) Turn OFF and turn ON the router. After the router restarts, use the show platform command to check the version of the CPLD:

**Example:**

```
C1111-8PW#show platform
Chassis type: C1111-8PWE

Slot Type State Insert time (ago)
--------- ------------------- --------------------- -----------------
0 C1111-8PWE ok 00:02:49
0/0 C1111-2x1GE ok 00:00:44
0/1 C1111-ES-8 ok 00:00:44
0/2 ISR-AP1100AC-E ok 00:00:44
R0 C1111-8PWE ok, active 00:02:49
```
Step 5  
At the system prompt, press Enter to start the upgrade:

Example:

Upgrade CPLD on Route-Processor 0 from current version 14062321 to 14101324 [Press Enter to confirm]

This command could take up to 10 minutes, please wait and do not power-cycle the chassis or the card. Otherwise, hardware may be unrecoverable. The system will be automatically power-cycled upon completion. [Press Enter to confirm]

Upgrade cpld hw-programmable on Route-Processor 0  
Powercycling the chassis for upgrade to take effect

Initializing Hardware ....

a) After the router restarts automatically, use the show platform command to check the version of CPLD:

Example:

Router#show platform  
Chassis type: ISR4451-X/K9

Slot Type State Insert time (ago)  
----------------- ----------------- --------------------- ---------------------  
0 ISR4451-X/K9 ok 00:01:52  
1 ISR4451-X/9 ok 00:01:52  
2 ISR4451-X/K9 ok 00:01:52  
R0 ISR4451-X/K9 ok, active 00:01:52  
F0 ISR4451-X/K9 ok, active 00:01:52  
P0 Unknown ps, fail never  
P1 XXX-xxxxxx ok 00:01:37  
P2 ACS-4450-FANASSY ok 00:01:37

Slot CPLD Version Firmware Version  
----------------- ----------------- --------------------- ---------------------  
0 14061635 15.3(2r)S1  
1 14061635 15.3(2r)S1  
2 14061635 15.3(2r)S1  
R0 14061635 15.3(2r)S1  
F0 14061635 15.3(2r)S1

b) This example shows that the router is upgraded successfully.

Field-Programmable Hardware Device Commands

You can use the following field-programmable commands to perform a CPLD upgrade, display the package file version, or display progress during the upgrade:
ROMMON Overview

The ROMMON on an Cisco 1000 Series ISR must be upgraded if a system message on the router indicates that the ROMMON on the router requires an upgrade, or a Cisco technical support representative suggests a ROMMON upgrade.

The ROM Monitor is a bootstrap program that initializes the hardware and boots the Cisco IOS XE software when you power on or reload a router. When you connect a terminal to the router that is in ROM Monitor mode, the ROM Monitor command-line interface (CLI) prompt is displayed.

Checking the Current ROMMON Version

If you are unsure whether a ROMMON upgrade is required, use the show rom-monitor command or the show platform command.

```
Router# show rom-monitor r0
Router# show rom-monitor r0
System Bootstrap, Version 15.4(3r)S, RELEASE SOFTWARE (fc1)
Copyright (c) 1994-2014 by cisco Systems, Inc.
.
Router#show platform
Chassis type: ISR4451/K9

Slot Type State Insert time (ago)
--------- ------------------- --------------------- ------------------
0 ISR4451-X/K9 ok 00:03:25
0/0 ISR4451-X-4x1GE ok 00:02:46
1 ISR4451-X/K9 ok 00:03:25
2 ISR4451-X/K9 ok 00:03:25
R0 ISR4451-X/K9 ok, active 00:03:25
F0 ISR4451-X/K9 ok, active 00:03:25
P0 PWR-4450-10 ok 00:03:10
P1 Unknown ps, fail never
P2 ACS-4450-FANASSY ok 00:03:10
Slot CPLD Version Firmware Version
--------- ---------------------------------------------------------
0 14061635 15.4(3r)S
1 14061635 15.4(3r)S
2 14061635 15.4(3r)S
R0 14061635 15.4(3r)S
F0 14061635 15.4(3r)S
```

For command syntax and detailed information, see the Cisco IOS Interface and Hardware Component Command Reference.
Upgrading the ROMMON for a Cisco 1000 Series ISRs

To upgrade the ROMMON, perform these steps:

**Step 1**  (Optional) To display the current ROMMON version at the IOS prompt, use the following command:
Resolved Caveats

The following sections list the issues resolved in each ROMMON release:

Resolved Caveats in ROMMON Release 16.8(1r)

All resolved bugs for this release are available in the Cisco Bug Search Tool.
### Identifier | Description
--- | ---
CSCvg46562 | Free 256MB of reserved memory
CSCvh23316 | Missing USB3.0 Flash Drive
CSCvg37458 | ISR4K goes into booting loop with "flash:" in boot statement.

## Additional References

The following sections provide references related to this function.

### Related Documents

<table>
<thead>
<tr>
<th>Related Topic</th>
<th>Document Title</th>
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<tbody>
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<td>Cisco IOS XE commands</td>
<td>Cisco IOS Master Commands List, All Releases</td>
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### Technical Assistance

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<th>Description</th>
<th>Link</th>
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</table>
| The Cisco Support website provides extensive online resources, including documentation and tools for troubleshooting and resolving technical issues with Cisco products and technologies.  
To receive security and technical information about your products, you can subscribe to various services, such as the Product Alert Tool (accessed from Field Notices), the Cisco Technical Services Newsletter, and Really Simple Syndication (RSS) Feeds.  