Upgrade Software and FPD

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Software and firmware compatibility matrix

These tables provide the compatibility of FPGA firmware versions for each hardware type and supported software release.

Table 1: FPGA firmware compatibility

Hardware type	FPGA	R24.2.1	R24.3.1	R25.1.1	R25.3.1	R25.4.1
NCS1K-E-OLT-C	OLT	3.14	3.16	3.32	3.4	3.44
NCS1K-OLT-R-C	Raman-1	3.14	3.16	3.32	3.32	3.42
NCS1K-OLT-C	OLT	3.16	3.16	3.32	3.4	3.44
NCS1K-ILA-2R-C	ILA	3.16	3.16	3.32	3.4	3.44
	Raman-1	3.16	3.16	3.32	3.32	3.42
	Raman-2	3.16	3.16	3.32	3.32	3.42
NCS1K-ILA-R-C	ILA	3.16	3.16	3.32	3.4	3.44
	Raman-1	3.16	3.16	3.32	3.32	3.42
NCS1K-ILA-C	ILA	3.14	3.16	3.32	3.4	3.44

NCS1020-SA	ADMConfig	1	1	1	1	1
	IoFpgaLow	1.08	1.12	1.12	1.12	1.12
	IoFpgaLowGolden	1.08	1.08	1.08	1.08	1.08
	IoFpgaUp	1.08	1.1	1.1	1.1	1.1
	IoFpgaUpGolden	1.08	1.08	1.08	1.08	1.08
	SsdIntelSC2KB	1.2	1.2	1.2	1.3	1.3
NCS1K14-CCMD-16-C	CpuModFw	242.1	243.1	251.1	253.14	254.100
	OptModFw	20.02	20.02	20.02	20.02	20.04

Table 2: FPGA firmware compatibility for NCS1K4-AC-PSU-2

FPGA	**R24.2.1**	**R24.3.1**	**R25.1.1**	**R25.3.1**	**R25.4.1**
AP-PriMCU	1.03	1.03	1.03	1.03	1.03
AP-SecMCU	1.05	1.05	1.05	1.05	1.05

Table 3: FPGA firmware compatibility for NCS1010-CTR2-B-K9

FPGA	**R24.2.1**	**R24.3.1**	**R25.1.1**	**R25.3.1**	**R25.4.1**
BIOS	5.2	5.2	5.5	5.5	5.6
BIOS-Golden	5.2	5.2	5.2	5.2	5.20
CPU_FPGA	1.06	1.1	1.12	1.12	1.12
CpuFpgaGolden	1.06	1.06	1.06	1.06	1.02
ADMConfig	1	1	1	1.00	1.00
SsdIntelSC2KB	1.2	1.2	1.2	1.3	1.3
TamFw	9.07	9.07	9.07	9.07	9.07
TamFwGolden	9.07	9.07	9.07	9.07	9.07

Plan the Software Upgrade

Before you upgrade the software version, prepare the NCS 1020 to ensure that the upgrade process is seamless.

This section describes the following processes to prepare your NCS 1020 for an upgrade:

Backup Current Configuration

The ability to recover from a disaster is an essential part of any system maintenance plan. We recommend you backup the configurations in a secure remote location and verify that the transfer is a success, both before and after upgrade.

Procedure

Step 1 Create a backup of the running configuration to one of the following locations based on your requirement:

- Copy the configuration to the `harddisk:` location on the NCS 1020.

```
RP/0/RP0/CPU0:ios#copy running-config harddisk:/running_config-<mmddyyyy>
Destination filename [running_config-<mmddyyyy>]?
Building configuration...
[OK]
Verifying checksum...  OK (0xDCF1)
```

- Copy the configuration to a remote server. Ensure the NCS 1020 has root access to the server.

```
RP/0/RP0/CPU0:ios#scp harddisk:/ running_config-<mmddyyyy>
user:password@<ip-address>:<location>
```

Step 2 Verify that the configuration is backed up.

Check System Stability

System stability checks are essential to measure the efficiency and ability of an upgrade to function over an extended period.

At the EXEC prompt, execute the following commands to assess basic system stability checks before and after the software upgrade.

Command	Reason	Workaround
show platform	Verify that all nodes are in `IOS XR RUN/OPERATIONAL` state	NA
show install active summary	Verify that the proper set of packages are active	NA
show install committed summary	Verify that the proper set of committed packages are same as active	Execute 'install commit' command
clear configuration inconsistency	Verify/fix configuration file system	NA
show hw-module fpd	Ensure all the FPD versions status are CURRENT	Execute `upgrade hw-module fpd` command
show media	Display the current state of the disk storage media	To free up space, remove older .iso image files and bug fix .tar files.
show inventory	Show chassis inventory information	NA

Obtain Install Files

You can obtain the install files based on one of the following options that is best suited to your network:

- **Base ISO and Optional RPMs:** You can upgrade the software through the standard method where you install the ISO followed by the required RPMs.
- **Golden ISO:** You can build a customized golden ISO (GISO) image with the base ISO and the required RPMs to automatically upgrade the software.

Standard ISO and RPMs

Note Contact your Cisco Systems technical support representative for NCS1020 ISO image with required IOS-XR version and optional RPM's.

Golden ISO

Note Contact your Cisco Systems technical support representative for NCS1020 Golden GIOS image creation with required IOS-XR version and optional RPM's information.

Create Repository to Access Install Files

A **Repository** is a directory where the ISO, RPMs, and their metadata are downloaded. The package manager uses this repository to query the packages.

The repository can either be created locally on the NCS 1020, or on a remote location that can be accessed through FTP, HTTP, or HTTPS. In a repository, you can create directories based on different Cisco IOS XR platforms, releases or both. You can create and use multiple repositories. The files to be installed can saved in the local repository, remote repository or a combination of both.

Note The Golden ISO (GISO) method does not require you to create a repository. However, you can still install the GISO from a remote repository.

Important Each package is named based on its name, version, software release, and architecture. Hence, any packages that have these attributes in common and differ only by platform are indistinguishable. We recommend that you create different repositories for different platforms and releases.

Upgrade the Software

This section provides information about the processes involved in upgrading the IOS XR software on your Cisco NCS 1020.

The Cisco IOS XR software can be upgraded using one of these methods:

Software upgrade and downgrade matrix

The following table lists the upgrade and downgrade paths supported for Cisco NCS 1020.

Source Release	Destination Release	Bridge SMU	Source Release	Destination Release	Target SMU
2531	2541	NA	2541	2531	NA
2511	2541	CSCwn69606	2541	2511	NA
2431	2541	CSCwm77418	2541	2431	CSCwm77418

Note When downgrading the software image from release 24.4.x to an earlier version, we recommend to manually downgrade the line card firmware as well to prevent any impact on various functionalities.

Upgrade NCS 1020 Using CLI Commands

There are two options to upgrade your Cisco IOS XR software using the Command Line Interface (CLI):

- Base ISO and optional RPMs
- Golden ISO (GISO)

Before you begin

Note Ensure that you have adequate disk space. Run the **fsck** command to check the status of the file system, for a successful IOS XR upgrade. You must run the **fsck** command in the System Admin EXEC mode to install a System Admin package, and in the XR EXEC mode to install the XR package. All install commands are applicable in both the System Admin EXEC mode and in XR EXEC mode. System Admin install operations are done from XR EXEC mode.

Note If an interface on a NCS 1020 does not have a configuration and is brought up by performing no-shut operation, then upon NCS 1020 reload, the interface state changes to **admin-shutdown** automatically.

Perform a system upgrade by installing a base package–Cisco IOS XR Unicast Routing Core Bundle.

Upgrade NCS 1020 Using YANG Data Models

Data models are a programmatic way of configuring and collecting operational data of a network device. They replace the process of manual configuration and can be used to automate configuration tasks across heterogeneous devices in a network.

Access Install-related Data Models

You can use YANG data models to install and upgrade the NCS 1020. The data models are packaged with the release image in the `/pkg/yang` directory.

Procedure

Step 1 Navigate to the directory in the release image where the YANG data models are available.

Example:

```
RP/0/RP0/CPU0:ios#run
[node_RP0_CPU0:~]$cd /pkg/yang
```

Step 2 View the list of install-related data models on your NCS 1020.

Example:

```
node0_RP0_CPU0:/pkg/yang]$ls -ltr *install*
-rw-r--r--.    1    root    root    8646    Jul    2    01:59    Cisco-IOS-XR-install-act.yang
-rw-r--r--.    1    root    root    7267    Jul    2    01:59    Cisco-IOS-XR-install-search-act.yang
-rw-r--r--.    1    root    root    10664   Jul    2    01:59    Cisco-IOS-XR-install-augmented-act.yang
-rw-r--r--.    1    root    root    2511    Jul    2    02:00    Cisco-IOS-XR-um-install-cfg.yang
-rw-r--r--.    1    root    root    2270    Jul    2    02:04    Cisco-IOS-XR-install-cfg.yang
-rw-r--r--.    1    root    root    6222    Jul    2    02:04    Cisco-IOS-XR-install-oper.yang
-rw-r--r--.    1    root    root    14009   Jul    2    02:04
Cisco-IOS-XR-install-augmented-oper.yang
```

The following table describes the function of the install-related data models:

Date Model	Description
Cisco-IOS-XR-um-install-cfg	Unified data model that contains a collection of YANG definitions for Cisco IOS XR install package configuration, and augments the modules with configuration data.
Cisco-IOS-XR-install-oper	Operational data model to view details that are related to basic package information, active and committed packages, and fixes.
Cisco-IOS-XR-install-cfg	Configuration data model to specify the location of the install source.
Cisco-IOS-XR-install-act	Action model to perform basic install operations and software upgrade.
Cisco-IOS-XR-install-search-act	Action model that contains a collection of YANG definitions for install actions related to searching for package information.
Cisco-IOS-XR-install-augmented-oper	Augmented operational model that displays information aboutpackaging, atomic changes, and history of the install operation on the NCS 1020.
Cisco-IOS-XR-install-augmented-act	Action model to perform flexible install operations, includingcontrolling the exact timing of system reloads and rolling back to a previous commit.
Cisco-IOS-XR-shellutil-copy-act	Action model to copy files on the NCS 1020 from a source location.

You can also access the supported data models to install Cisco IOS XR software from the Github repository.

Use Manageability Agent to Connect to NCS 1020

Use a manageability agent like NETCONF or gRPC to connect and communicate with the NCS 1020. You can send Remote Procedure Calls (RPC) requests to configure or retrieve operational data from the NCS 1020. The NCS 1020 processes the request and responds to the request through an RPC response. You use the RPCs to send requests to install the software by populating the relevant parameters of a container and leaf in the data model. For more information about understanding the data model structure and using data models, see the .

Generate RPC Messages to Install IOS XR Image

Before you begin

Not all software versions are supported as the target upgrade software version. You must review the supported upgrade and downgrade paths, hardware or software limitations, and bridging SMUs required for the version.
.

Procedure

Step 1 Use the `install-replace` RPC on the `Cisco-IOS-XR-install-act.yang` data model to upgrade the NCS 1020(s).

Step 2 Configure the values of the `source-type`, `source`, and `file` parameters.

Step 3 Send `edit-config` NETCONF RPC request using the data model to configure the repository. Edit the values in the `repositories` parameters and send this request to the NCS 1020 from the client.

Example:

In this example, the request is to install the `ncs1010-x64-24.2.1.iso` image from the local repository.

```
<rpc xmlns="urn:ietf:params:xml:ns:netconf:base:1.0" message-id="101">
  <edit-config>
    <target>
      <candidate/>
    </target>
    <config>
      <install xmlns="http://cisco.com/ns/yang/Cisco-IOS-XR-install-cfg">
        <repositories>
          <repository>
            <id>repo_local</id>
            <url>file:///harddisk:/repo/</url>
            <description>local repository</description>
          </repository>
        </repositories>
      </install>
    </config>
  </edit-config>
</rpc>
```

View the RPC response received from the NCS 1020.

```
<?xml version="1.0"?>
<rpc-reply message-id="101" xmlns="urn:ietf:params:xml:ns:netconf:base:1.0">
 <ok/>
</rpc-reply>
```

In the response, the NCS 1020 acknowledges the configuration and sends a reply to the client with an `ok` message.

Step 4 Apply the changes to activate the ISO on the NCS 1020 using RPCs by using the `install-apply`RPC on the`Cisco-IOS-XR-install-augmented-act.yang`datamodel and send the RPC from the client to the NCS 1020.

Example:

```
<rpc xmlns="urn:ietf:params:xml:ns:netconf:base:1.0" message-id="101">
  <install-apply xmlns="http://cisco.com/ns/yang/Cisco-IOS-XR-install-augmented-act">
   <apply-method>least-impactful</apply-method>
  </install-apply>
</rpc>
```

View the RPC response received from the NCS 1020.

```
<?xml version="1.0"?>
  <rpc-reply message-id="101" xmlns="urn:ietf:params:xml:ns:netconf:base:1.0">
   <op-id xmlns="http://cisco.com/ns/yang/Cisco-IOS-XR-install-augmented-act">2.1</op-id>
  </rpc-reply>
```

In the response, the NCS 1020 sends an ID indicating that the changes are applied successfully.

Step 5 Verify that the software upgrade is successful. Use the `get`RPCon `Cisco-IOS-XR-install-oper.yang`data model. Edit the `install`parameter and send an RPC request from the client to the NCS 1020.

Example:

```
<rpc xmlns="urn:ietf:params:xml:ns:netconf:base:1.0" message-id="101">
  <get>
   <filter>
    <install xmlns="http://cisco.com/ns/yang/Cisco-IOS-XR-install-oper">
     <request/>
    </install>
   </filter>
  </get>
</rpc>
```

View the RPC response received from the NCS 1020.

```
<?xml version="1.0"?>
  <rpc-reply message-id="101" xmlns="urn:ietf:params:xml:ns:netconf:base:1.0">
   <data>
    <install xmlns="http://cisco.com/ns/yang/Cisco-IOS-XR-install-oper">
     <request>
      <request>install commit</request>
      <state>success</state>
     <timestamp>2022-06-27 T02:52:07Z</timestamp>
    <operation-id>26</operation-id>
   </request>
  </install>
```

The state of the install operation in the RPC response indicates that the software and the RPMs are upgraded successfully.

What to do next

Perform prelimiary checks to verify that the NCS 1020 is upgraded successfully.

Install IOS XR Image

Install ISO and RPMs

Use this procedure to install the base ISO and optional RPMs.

Before you begin

Ensure you have created a repository locally on the NCS 1020 or on a remote server which is reachable over HTTP, HTTPS or FTP. This repository will be used to copy the required RPMsC. Ensure the NCS 1020 can reach the repository server over the Management Ethernet interface. For information about creating the repository to host the RPMs, see Create Repository to Access Install Files, on page 4.

Procedure

Step 1 You can either install from the remote repository or copy the ISO image file to the /harddisk: of the NCS 1020.

Example:

```
RP/0/RP0/CPU0:ios#scp root@<ip-address>:/<dir>/ncs1010-x64-24.2.1.iso harddisk:
```

Step 2 To verify data integrity, verify the md5 checksum of the copied file with the original MD5 values on CCO.

Example:

```
RP/0/RP0/CPU0:ios#show md5 file /harddisk:/ncs1010-x64-24.2.1.iso
```

Step 3 Install the base image to upgrade the system.

- **Option 1:** Install ISO without control over reload timing.

  ```
  RP/0/RP0/CPU0:ios#install replace /harddisk:/ncs1010-x64-24.2.1.iso
  ```

  The image is installed, the changes are applied through a reload or a restart of the system, and commits the changes. However, you do not have control over the timing of the reload or restart —these occur as soon as the package operation completes and the system is ready.

  If you want to control when your system reloads (management of a network outage), we recommend that you schedule an upgrade window and perform an **install replace**, letting the system reload without intervention.

- **Option 2:** Install ISO with control over reload timing.

  a. Install the image.

  ```
  RP/0/RP0/CPU0:ios#install package replace /harddisk:/ncs1010-x64-24.2.1.iso
  ```

  b. Apply the changes.

  ```
  RP/0/RP0/CPU0:ios#install apply [reload | restart]
  ```

  You can use either the `reload` or `restart` options based on the file that is installed. To determine whether a `reload` or `restart` is required, check the output of **show install request** command. The output indicates the required actions.

Step 4 After the base image is upgraded, install the additional packages.

If a system fails to boot successfully, or reboots unexpectedly when the package is undergoing a version change, the system is automatically recovered to its old software state.

Note
If you perform a manual or automatic system reload without completing the transaction with the **install commit** command, the action will revert the system to the point before the install transaction commenced, including any configuration changes. Only the log is preserved for debugging.

Install Golden ISO

Use this procedure to install the Golden ISO (GISO) that contains the base ISO and a customized list of optional RPMs that you built using the *gisobuild.py* tool. For details, see Build Customized Golden ISO Image.

Golden ISO (GISO) upgrades the NCS 1020 to a version that has a predefined list of bug fixes (sometimes also called software maintenance updates) with a single operation.

To update the system to the same release version with a different set of bug fixes:

- Create a GISO with the base version and all the bug fixes you require
- Use the **install replace** or **install package replace** commands to install the GISO.

The GISO can include bridging bug fixes for multiple source releases, and installs only the specific bridging bug fixes required for the target release.

The bridging bug fix RPMs can be used in the following scenarios:

- To resolve a bug that might stop upgrade.
- To meet the prerequisite requirements of a new release version that were not met by the earlier version.

Note The **install replace** command is supported only with GISO, but not with .rpm packages directly.

Procedure

Step 1 Copy the GISO image file to either the /harddisk: of the NCS 1020 or a repository based on your requirement.

Example:

In this example, the image is copied to the /harddisk: of the NCS 1020.

```
RP/0/RP0/CPU0:ios#scp root@<ip-address>:/auto/tftp-test/ncs1010-x64-24.2.1.iso harddisk:
```

Step 2 Install the GISO.

- **Option 1:** Install GISO without control over reload timing.

  a. Install GISO to upgrade to a new release, add or remove bugfixes or optional packages.

  ```
  RP/0/RP0/CPU0:ios#install replace source-location/giso-name.iso
  ```

  The *source-location* can be one of the following locations based on step 1.

  - Local path to the GISO—files located in or under `/var/xr/disk1/`, `/harddisk:/` or `/misc/disk1/`

- Remote repository—`ftp://<server>[;<vrf>]/<remote_path>` or `http://<server>[;<vrf>]/<remote_path>`

  This command runs the replace operation and applies the new version via NCS 1020 restart or reload, whichever is least impactful, given the change. For example, if you have a GISO that is the same as your base image except one bugfix, and that bugfix can be applied by process restart, the command will install the bugfix and apply by restart, no NCS 1020 reload occurs. However, you do not have control over the timing of the reload or restart—these operations occur as soon as the packaging is complete and the system is ready. If you want to control the timing of system reloads, we recommend that you schedule an upgrade window and run the **install replace** command, allowing the system to reload without manual intervention or network impact.

b. [Optional] Specify **reload** keyword to force reload for all operations. This may be useful if you want a reliable flow.

c. [Optional] Specify **commit** keyword for the install, apply and commit operations to be performed without user intervention.

- **Option 2:** Install GISO with control over reload timing.

a. Install GISO to upgrade to a new release, add or remove bugfixes or optional packages. The functionality is similar to **install replace** command, except that the staging of packaging changes is performed using this command.

```
RP/0/RP0/CPU0:ios#install package replace source-location/giso-name.iso
```

The **install package replace** command does not apply the changes.

b. Apply the changes.

```
RP/0/RP0/CPU0:ios#install apply [reload | restart]
```

You can use either the `reload` or `restart` options based on the change that is installed. You can only apply the changes by restarting the software if the difference between the GISO being installed and the running image is minimal such as bugfixes or package updates.

To determine whether a `reload` or `restart` is required, check the output of **show install request** command. The output indicates the required actions.

Note

A GISO label is a string that identifies a GISO. Any install operation, such as adding or removing a package or modifying the software image (replace or package replace) will change the custom label to a system-generated default label. For example:

```
RP/0/RP0/CPU0:ios#show install active summary
Thu May 30 19:28:28.720 IST
Active Packages:    XR: 153    All: 1321
Label:              24.2.1.40I
XR Software Hash:      2cda979eb34cdbbbf204a5d4e080c4939d2e6311c044fcf4f634f8fe26fa3f38

Optional Packages                                                    Version
---------------------------------------------------- ---------------------------
xr-bgp                                                      24.2.1.40Iv1.0.0-1
xr-healthcheck                                              24.2.1.40Iv1.0.0-1
xr-ipsla                                                    24.2.1.40Iv1.0.0-1
xr-is-is                                                    24.2.1.40Iv1.0.0-1
xr-lldp                                                     24.2.1.40Iv1.0.0-1
xr-mpls-oam                                                 24.2.1.40Iv1.0.0-1
xr-netsim                                                   24.2.1.40Iv1.0.0-1
```

```
xr-olc                                                          24.2.1.40Iv1.0.0-1
xr-ospf                                                         24.2.1.40Iv1.0.0-1
xr-perfmgmt                                                     24.2.1.40Iv1.0.0-1
xr-track                                                        24.2.1.40Iv1.0.0-1
```

In this example, the software image is modified to remove the CDP package.

```
RP/0/RP0/CPU0:ios#install package remove xr-cdp

Install remove operation 39.1.1 has started
Install operation will continue in the background
...
Packaging operation 39.1.1: 'install package remove xr-cdp' completed without error
```

Apply the changes.

```
RP/0/RP0/CPU0:ios#install apply
Thu Feb 02 11:13:09.015
Once the packaging dependencies have been determined, the install operation may have to reload the
system.
If you want more control of the operation, then explicitly use 'install apply restart' or 'install
apply reload' as
reported by 'show install request'.
Continue? [yes/no]:[yes] yes
RP/0/RP0/CPU0:Feb 02 11:13:12.771 : instorch[404]: %INSTALL-6-ACTION_BEGIN : Apply by restart 39.1
started
Install apply operation 39.1 has started
Install operation will continue in the background
```

View the software version.

```
RP/0/RP0/CPU0:ios#show version
Wed Jun 12 14:43:12.934 IST
Cisco IOS XR Software, Version 24.2.1 LNT
Copyright (c) 2013-2024 by Cisco Systems, Inc.

Build Information:
 Built By     : cisco
 Built On     : Tue Jun 11 13:58:26 UTC 2024
 Build Host   : iox-ucs-033
 Workspace    : /auto/srcarchive11/prod/24.2.1/ncs1010/ws/
 Version      : 24.2.1
 Label        : 24.2.1
cisco NCS1010 (C3758R @ 2.40GHz)
cisco NCS1020-SA (C3758R @ 2.40GHz) processor with 32GB of memory
NCS 1020 Chassis
```

The `GISO1` custom label is replaced with the label `24.2.1` generated by the system.

Verify the Software Upgrade

This section provides information about the processes involved in verifying the upgraded software on your Cisco NCS 1020.

This section contains the following topics:

Check System Stability

System stability checks are essential to measure the efficiency and ability of an upgrade to function over an extended period.

At the EXEC prompt, execute the following commands to assess basic system stability checks before and after the software upgrade.

Command	Reason	Workaround
show platform	Verify that all nodes are in `IOS XR RUN/OPERATIONAL` state	NA
show install active summary	Verify that the proper set of packages are active	NA
show install committed summary	Verify that the proper set of committed packages are same as active	Execute 'install commit' command
clear configuration inconsistency	Verify/fix configuration file system	NA
show hw-module fpd	Ensure all the FPD versions status are CURRENT	Execute `upgrade hw-module fpd` command
show media	Display the current state of the disk storage media	To free up space, remove older .iso image files and bug fix .tar files.
show inventory	Show chassis inventory information	NA

NCS 1020 FPD

A Field Programmable Device (FPD) refers to any programmable hardware device on a chassis, which includes a Field Programmable Gate Array (FPGA). NCS 1020 uses several FPDs that are necessary for chassis, route processor, line cards, and power modules to function properly.

Note If the FPD in a given SSD is not supported by the current IOS XR software release, the status is not displayed.

The following table lists the NCS 1020 FPDs that are distributed across route processor (RP), power modules (PM), line cards (LC), and Rack.

Table 4: NCS 1020 FPDs

Location	FPDs
RP	• ADMConfig • CpuFpga • CpuFpgaGolden • BIOS • BIOS-Golden • SsdIntelS4510 • SsdMicron5300 • SsdMicron5400 • TamFw • TamFwGolden
PM0 and PM1	• PO-PrimMCU • PO-SecMCU
LC	• ILA • OLT • Raman-1 • Raman-2 • CpuModFw • OptModFw
Rack	• IoFpgaLow • IoFpgaUp • IoFpgaLowGolden • IoFpgaUpGolden • ADMCONFIG • SsdIntelSC2KB • SsdMicron5400

Golden FPDs serve as backup FPDs for the primary FPDs. For example, **BIOS-Golden** is the backup Golden FPD for the **BIOS** primary FPD. If a primary FPD is corrupted, NCS 1020 boots with the corresponding Golden FPD. The Golden FPDs cannot be upgraded.

Retrieve FPD Information

There are multiple types of FPDs for each type of module. The **show hw-module fpd** command provides information about each FPD.

Note From R26.2.1, the SSD FPD name displayed in the output of show hw-module fpd command is changed from a vendor or model-specific name to a generic format: 'CPU-SSD' for RP locations and 'CHASSIS-SSD' for rack locations.

show hw-module fpd command output until R26.2.1

```
RP/0/RP0/CPU0:ios# show hw-module fpd

Mon Dec 22 10:01:56.338 UTC
Auto-upgrade:Enabled,PM excluded
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 NCS1010-CNT-B-K9      0.1   ADMCONFIG            CURRENT      1.00     1.00
    NOT REQ
0/RP0/CPU0 NCS1010-CNT-B-K9      0.1   BIOS             S   CURRENT      6.10     6.10
      0/RP0
0/RP0/CPU0 NCS1010-CNT-B-K9      0.1   BIOS-Golden      BS  CURRENT               1.30
      0/RP0
0/RP0/CPU0 NCS1010-CNT-B-K9      0.1   CpuFpga          S   CURRENT      1.12     1.12
      0/RP0
0/RP0/CPU0 NCS1010-CNT-B-K9      0.1   CpuFpgaGolden    BS  CURRENT               0.07
      0/RP0
0/RP0/CPU0 NCS1010-CNT-B-K9      0.1   SsdMicron5300    S   CURRENT      0.01     0.01
      0/RP0
0/RP0/CPU0 NCS1010-CNT-B-K9      0.1   TamFw            S   CURRENT      9.07     9.07
      0/RP0
0/RP0/CPU0 NCS1010-CNT-B-K9      0.1   TamFwGolden      BS  CURRENT               9.05
      0/RP0
0/PM0      NCS1K4-AC-PSU-2       1.0   PO-PriMCU            NOT READY
       N/A
0/PM0      NCS1K4-AC-PSU-2       1.0   PO-SecMCU            CURRENT      1.05     1.05
    NOT REQ
0/PM1      NCS1K4-AC-PSU-2       1.0   PO-PriMCU            CURRENT      1.03     1.03
    NOT REQ
0/PM1      NCS1K4-AC-PSU-2       1.0   PO-SecMCU            CURRENT      1.05     1.05
    NOT REQ
0/0/NXR0   NCS1K-E-ILA-RE-C      0.1   ILA              S   CURRENT      3.44     3.44
    NOT REQ
0/0/NXR0   NCS1K-E-ILA-RE-C      0.1   Raman-E-1        S   CURRENT      4.04     4.04
    NOT REQ
0/1/NXR0   NCS1K-E2-OLT-RE-C     0.1   E2_OLT           S   CURRENT      4.01     4.01
    NOT REQ
0/1/NXR0   NCS1K-E2-OLT-RE-C     0.1   Raman-E-1        S   CURRENT      4.04     4.04
    NOT REQ
0/Rack     NCS1020-SA            0.1   ADMCONFIG            CURRENT      1.00     1.00
    NOT REQ
0/Rack     NCS1020-SA            0.1   IoFpgaLow        S   CURRENT      1.12     1.12
    NOT REQ
0/Rack     NCS1020-SA            0.1   IoFpgaLowGolden  BS  CURRENT               0.07
    NOT REQ
0/Rack     NCS1020-SA            0.1   IoFpgaUp         S   CURRENT      1.10     1.10
    NOT REQ
0/Rack     NCS1020-SA            0.1   IoFpgaUpGolden   BS  CURRENT               0.06
```

```
    NOT REQ
0/Rack     NCS1020-SA            0.1   SsdIntelSC2KB    S   CURRENT      1.30     1.30
     0/Rack
```

show hw-module fpd command output from R26.2.1

```
RP/0/RP0/CPU0:ios# show hw-module fpd

Mon Dec 22 09:27:51.696 UTC
Auto-upgrade:Enabled,PM excluded
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 NCS1010-CNT-B-K9      0.1   ADMCONFIG            CURRENT      1.00     1.00
    NOT REQ
0/RP0/CPU0 NCS1010-CNT-B-K9      0.1   BIOS             S   CURRENT      6.10     6.10
      0/RP0
0/RP0/CPU0 NCS1010-CNT-B-K9      0.1   BIOS-Golden      BS  CURRENT               1.30
      0/RP0
0/RP0/CPU0 NCS1010-CNT-B-K9      0.1   CPU-SSD          S   CURRENT      0.01     0.01
      0/RP0
0/RP0/CPU0 NCS1010-CNT-B-K9      0.1   CpuFpga          S   CURRENT      1.12     1.12
      0/RP0
0/RP0/CPU0 NCS1010-CNT-B-K9      0.1   CpuFpgaGolden    BS  CURRENT               0.07
      0/RP0
0/RP0/CPU0 NCS1010-CNT-B-K9      0.1   TamFw            S   CURRENT      9.07     9.07
      0/RP0
0/RP0/CPU0 NCS1010-CNT-B-K9      0.1   TamFwGolden      BS  CURRENT               9.05
      0/RP0
0/PM0      NCS1K4-AC-PSU-2       1.0   PO-PriMCU            NOT READY
       N/A
0/PM0      NCS1K4-AC-PSU-2       1.0   PO-SecMCU            CURRENT      1.05     1.05
    NOT REQ
0/PM1      NCS1K4-AC-PSU-2       1.0   PO-PriMCU            CURRENT      1.03     1.03
    NOT REQ
0/PM1      NCS1K4-AC-PSU-2       1.0   PO-SecMCU            CURRENT      1.05     1.05
    NOT REQ
0/0/NXR0   NCS1K-E-ILA-RE-C      0.1   ILA              S   CURRENT      3.44     3.44
    NOT REQ
0/0/NXR0   NCS1K-E-ILA-RE-C      0.1   Raman-E-1        S   CURRENT      4.04     4.04
    NOT REQ
0/1/NXR0   NCS1K-E2-OLT-RE-C     0.1   E2_OLT           S   CURRENT      4.01     4.01
    NOT REQ
0/1/NXR0   NCS1K-E2-OLT-RE-C     0.1   Raman-E-1        S   CURRENT      4.04     4.04
    NOT REQ
0/Rack     NCS1020-SA            0.1   ADMCONFIG            CURRENT      1.00     1.00
    NOT REQ
0/Rack     NCS1020-SA            0.1   CHASSIS-SSD      S   CURRENT      1.30     1.30
     0/Rack
0/Rack     NCS1020-SA            0.1   IoFpgaLow        S   CURRENT      1.12     1.12
    NOT REQ
0/Rack     NCS1020-SA            0.1   IoFpgaLowGolden  BS  CURRENT               0.07
    NOT REQ
0/Rack     NCS1020-SA            0.1   IoFpgaUp         S   CURRENT      1.10     1.10
    NOT REQ
0/Rack     NCS1020-SA            0.1   IoFpgaUpGolden   BS  CURRENT               0.06
    NOT REQ
```

The following table describes the significant fields in the output of the **show hw-module fpd** command.

Table 5: Description of Fields in show hw-module fpd Command

Field	Description
Location	Location of the FPD.
Card type	PID of the modules such as chassis, card, CPU, and PSU.
HWver	Hardware version where the FPD resides.
FPD device	Name of the FPD.
ATR	Attribute codes. The possible values are: • B - Golden Image • S - Secure Image • P - Protect Image The attribute code of the primary FPDs is S and the Golden FPDs is BS.
Status	Status of the FPD. See Table 6: Description of FPD Status Values in show hw-module fpd Command, on page 17.
Running	FPD image version that has been activated and currently running in the FPD device.
Programd	FPD image version that has been programmed into the FPD device, but might not be activated.
Reload Loc	Indicates whether reload of the location is required or not.

The following table describes the possible values of the Status field in the output of the **show hw-module fpd** command.

Table 6: Description of FPD Status Values in show hw-module fpd Command

FPD Status	Description
NOT READY	The driver that owns the FPD device has not initialized the FPD client to handle this device.
CURRENT	FPD version is up to date and upgrade is not required.
NEED UPGD	Upgrade is required for this FPD. Check the output of the **show fpd package** command to determine the recommended FPD version.
UPGD PREP	FPD is preparing for upgrade.
IN QUEUE	Upgrade of this FPD is in queue.

FPD Status	Description
UPGD SKIP	FPD upgrade is not required. For example, • FPD version is up to date and compatible. • FPD image is protected.
UPGRADING	FPD upgrade started and the driver did not report the upgrade progress information yet.
%UPGD	Percentage of FPD upgrade completion.
RLOAD REQ	FPD upgrade is successfully completed and the FPD must be reloaded for the new version to take effect.
UPGD FAIL	FPD upgrade has failed. Check the syslog for failure reason. It could be a timeout or a failure that is reported by the driver.
UPGD DONE	FPD upgrade is successfully completed.

Verify if an FPD Upgrade is Required

Procedure

Step 1 Use the **show hw-module fpd** command to check whether all the FPDs are in the Current state.

If the status of any FPD is **NEED UPGD**, then the upgrade is required for that FPD.

Step 2 Use the **show fpd package** command to determine the FPDs that are supported with the current software release and the minimum hardware requirements for each FPD.

```
RP/0/RP0/CPU0:ios#show fpd package
Wed Apr 24 15:59:13.897 IST

================================ ================================================
                                         Field Programmable Device Package
                                 ================================================
                                                Req     SW      Min Req   Min Req
Card Type            FPD Description            Reload  Ver     SW Ver  Board Ver
=================== ========================== ====== ======= ======== =========
--------------------------------------------------------------------------------
NCS1010-CTR2-B-K9    ADMCONFIG                  NO      1.00      1.00      0.1
                     BIOS                       YES     5.20      5.20      0.0
                     BIOS-Golden                YES     5.10      0.01      0.0
                     CpuFpga                    YES     1.06      1.06      0.0
                     CpuFpgaGolden              YES     1.02      0.01      0.0
                     SsdIntelS4510              YES    11.32     11.32      0.0
                     SsdMicron5300              YES     0.01      0.01      0.0
                     SsdMicron5400              YES     0.02      0.02      0.0
                     TamFw                      YES     9.07      9.07      0.0
                     TamFwGolden                YES     9.06      0.01      0.0
--------------------------------------------------------------------------------
NCS1010-CTR2-K9      ADMCONFIG                  NO      1.00      1.00      0.1
                     BIOS                       YES     5.20      5.20      0.0
```

```
                    BIOS-Golden              YES     5.10      0.01      0.0
                    CpuFpga                  YES     1.06      1.06      0.0
                    CpuFpgaGolden            YES     1.02      0.01      0.0
                    SsdIntelS4510            YES    11.32     11.32      0.0
                    SsdMicron5300            YES     0.01      0.01      0.0
                    SsdMicron5400            YES     0.02      0.02      0.0
                    TamFw                    YES     9.07      9.07      0.0
                    TamFwGolden              YES     9.06      0.01      0.0
--------------------------------------------------------------------------------
NCS1020-SA          ADMCONFIG                NO      1.00      1.00      0.0
                    IoFpgaLow                NO      1.08      1.08      0.0
                    IoFpgaLowGolden          NO      0.07      0.01      0.0
                    IoFpgaUp                 NO      1.08      1.08      0.0
                    IoFpgaUpGolden           NO      0.06      0.01      0.0
                    SsdIntelSC2KB            YES     1.20      1.20      0.0
                    SsdMicron5400            YES     0.02      0.02      0.0
--------------------------------------------------------------------------------
NCS1K-E-ILA-2R-C    ILA                      NO      3.14      3.14      0.1
                    ILA                      NO      0.28      0.28     99.1
                    Raman-1                  NO      3.14      3.14      0.1
                    Raman-1                  NO      0.28      0.28     99.1
                    Raman-2                  NO      3.14      3.14      0.1
                    Raman-2                  NO      0.28      0.28     99.1
--------------------------------------------------------------------------------
NCS1K-E-ILA-R-C     ILA                      NO      3.14      3.14      0.1
                    ILA                      NO      0.28      0.28     99.1
                    Raman-1                  NO      3.14      3.14      0.1
                    Raman-1                  NO      0.28      0.28     99.1
--------------------------------------------------------------------------------
NCS1K-E-ILA-R-C-2   ILA                      NO      3.14      3.14      0.1
                    ILA                      NO      0.28      0.28     99.1
                    Raman-2                  NO      3.14      3.14      0.1
                    Raman-2                  NO      0.28      0.28     99.1
--------------------------------------------------------------------------------
NCS1K-E-OLT-C       OLT                      NO      3.14      3.14      0.1
                    OLT                      NO      0.28      0.28     99.1
--------------------------------------------------------------------------------
NCS1K-E-OLT-L       OLT                      NO      3.12      3.12      0.1
--------------------------------------------------------------------------------
NCS1K-E-OLT-R-C     OLT                      NO      3.14      3.14      0.1
                    OLT                      NO      0.28      0.28     99.1
                    Raman-1                  NO      3.14      3.14      0.1
                    Raman-1                  NO      0.28      0.28     99.1
--------------------------------------------------------------------------------
NCS1K-ILA-2R-C      ILA                      NO      3.14      3.14      0.1
                    ILA                      NO      0.28      0.28     99.1
                    Raman-1                  NO      3.14      3.14      0.1
                    Raman-1                  NO      0.28      0.28     99.1
                    Raman-2                  NO      3.14      3.14      0.1
                    Raman-2                  NO      0.28      0.28     99.1
--------------------------------------------------------------------------------
NCS1K-ILA-C         ILA                      NO      3.14      3.14      0.1
                    ILA                      NO      0.28      0.28     99.1
--------------------------------------------------------------------------------
NCS1K-ILA-L         ILA                      NO      3.12      3.12      0.1
--------------------------------------------------------------------------------
NCS1K-ILA-R-C       ILA                      NO      3.14      3.14      0.1
                    ILA                      NO      0.28      0.28     99.1
                    Raman-1                  NO      3.14      3.14      0.1
                    Raman-1                  NO      0.28      0.28     99.1
--------------------------------------------------------------------------------
NCS1K-OLT-C         OLT                      NO      3.14      3.14      0.1
                    OLT                      NO      0.28      0.28     99.1
--------------------------------------------------------------------------------
```

```
NCS1K-OLT-L          OLT                        NO      3.12      3.12      0.1
-------------------------------------------------------------------------------
NCS1K-OLT-R-C        OLT                        NO      3.14      3.14      0.1
                     OLT                        NO      0.28      0.28     99.1
                     Raman-1                    NO      3.14      3.14      0.1
                     Raman-1                    NO      0.28      0.28     99.1
-------------------------------------------------------------------------------
NCS1K14-CCMD-16-C    CpuModFw                   NO     42.14     42.14      0.0
                     OptModFw                   NO     20.02     20.02      0.0
-------------------------------------------------------------------------------
NCS1K14-CCMD-16-L    CpuModFw                   NO     42.14     42.14      0.0
                     OptModFw                   NO     20.02     20.02      0.0
-------------------------------------------------------------------------------
NCS1K4-AC-PSU-2      PO-PriMCU                  NO      1.03      1.03      0.1
                     PO-SecMCU                  NO      1.05      1.05      0.1
```

The following table describes the fields in the output of the **show fpd package** command.

Table 7: Description of Fields in show fpd package Command

Field	Description
Card Type	PID of the modules such as chassis, card, CPU, and PSU.
FPD Description	Description of the FPD.
Req Reload	Determines whether reload is required to activate the FPD image.
SW Ver	Recommended FPD software version for the associated module running the current Cisco IOS XR Software.
Min Req SW Ver	Minimum required FPD software version to operate the module.
Min Req Board Ver	Minimum required hardware version for the associated FPD. A minimum hardware requirement of version 0.0 indicates that all the hardware can support this FPD version.

FPD can be upgraded using two methods:

- Manual upgrade
- Automatic upgrade

Upgrade FPDs Manually

Use the following procedure to upgrade the FPDs manually.

Note The Golden FPDs cannot be upgraded using the CLI.

Procedure

Step 1 Use the **show hw-module fpd** command to display information about the current FPD version.

You can use this command to determine if you must upgrade the FPD.

Step 2 Use the **show alarms brief system active** command to display the active alarms.

You must upgrade the FPD when the **One Or More FPDs Need Upgrade Or Not In Current State** alarm is present.

Step 3 Use the **upgrade hw-module location** *[location-id]* **fpd** *[fpd name]* command to upgrade a specific FPD.

After upgrading the FPD, the user must wait for upgrade completion. The progress of the FPD upgrade can be monitored using the **show hw-module fpd** command.

Example:

```
RP/0/RP0/CPU0:ios#upgrade hw-module location 0/Rack fpd IoFpgaLow
```

Note
The FPDs of power modules belong to 0/PM0 and 0/PM1 locations. The FPDs belonging to both the PM locations cannot be simultaneously upgraded.

Step 4 Use the **reload location** *location-id* to reload the FPDs belonging to a specific location with the new version.

The **Reload Loc** field in the output of **show hw-module fpd** command indicates whether the reload is required or not.

Example:

```
RP/0/RP0/CPU0:ios#reload location 0/RP0/CPU0
```

Step 5 (Optional) Use the **upgrade hw-module location all fpd all** command to upgrade all the FPDs at once.

Step 6 (Optional) Use the **upgrade hw-module [location** [*location-id* | **all**]] **fpd** [*fpd name*] | **all**] command to upgrade a specific FPD, all the FPDs, or the FPDs belonging to a specific location.

Example:

```
RP/0/RP0/CPU0:ios#upgrade hw-module location all fpd all
```

Note
The FPDs of power modules and SSDs cannot be forcefully upgraded.

Upgrade FPDs Automatically

The automatic FPD upgrade upgrades the FPD version of all the modules to the latest version. When automatic FPD upgrade is enabled, all the FPDs (except the Golden FPDs) that are in NEED UPGD status are upgraded to CURRENT status during the software upgrade.

In NCS 1020, automatic FPD upgrade is enabled by default.

Procedure

Use the following commands to disable automatic FPD upgrade.

Example:

```
RP/0/RP0/CPU0:ios#configure
RP/0/RP0/CPU0:ios(config)#fpd auto-upgrade disable
RP/0/RP0/CPU0:ios(config)#commit
RP/0/RP0/CPU0:ios(config)#end
```