System Setup and Software Installation Guide for Cisco NCS 1002

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Americas Headquarters
Cisco Systems, Inc.
170 West Tasman Drive
San Jose, CA 95134-1706
USA
http://www.cisco.com
Tel: 408 526-4000
800 553-NETS (6387)
Fax: 408 527-0883

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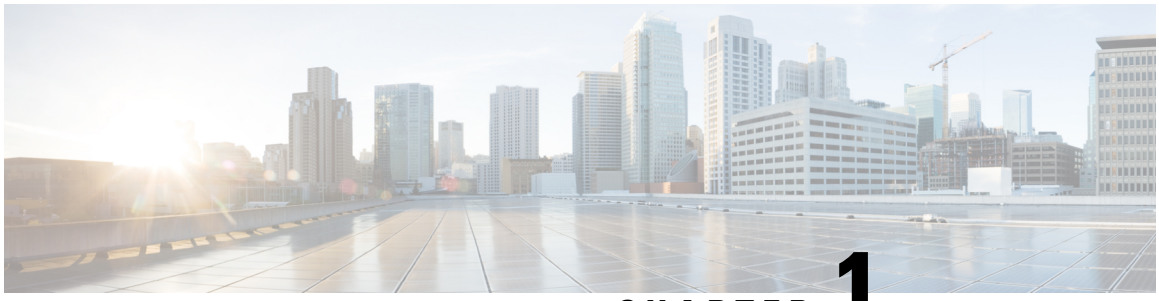


CHAPTER 1

Cisco NCS 1002 Product Overview

The Cisco Network Convergence System (NCS) 1002 is a 2 RU system that delivers fully programmable, high-bandwidth capacity (up to 250 Gbps) wavelengths over distances exceeding 3000 km using existing fiber. Powered by the industry-leading Cisco IOS XR operating system, Cisco NCS 1002 offers robust functions such as third party application hosting, machine-to-machine interface, telemetry and flexible package delivery.

NCS 1002 delivers the following benefits:

- Supports up to 2 Tbps capacity
- Transports 100, 200, or 250Gbps per wavelength on the same platform through software provisioning
- Transports 10 GE, 40 GE, and 100 GE on the same platform through software provisioning
- Supports grid-less tuning for flex-grid dense wavelength-division multiplexing (DWDM)
- Supports different modulation formats (PM-QPSK or PM-16QAM)
- Supports 7% or 20% Soft Decision (SD) FEC for maximum optical performance
- Allows for automated installation, configuration and monitoring
- Supports machine-to-machine (M2M) APIs based on YANG models for ease of configuration
- Supports a telemetry agent for a pub-sub model of device monitoring

- Command Modes, on page 1

Command Modes

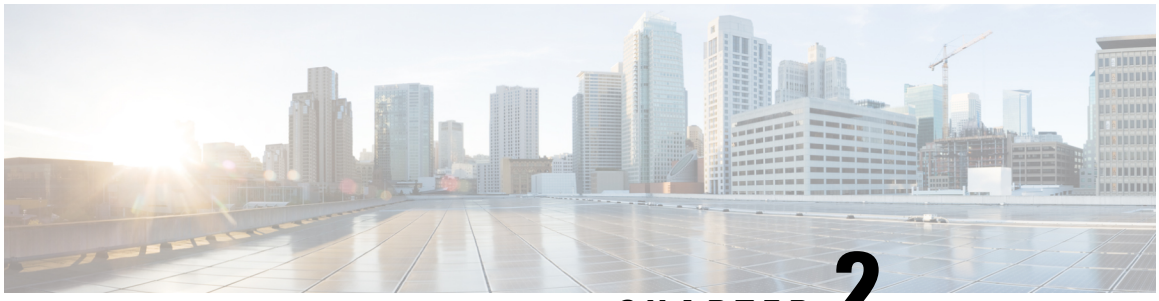
The Cisco NCS 1002 system runs on the Cisco IOS XR operating system. This table lists command modes.

Command Mode	Description
XR execution mode	Displays and monitors the operational state in XR mode. Example: `RP/0/RP0/CPU0:ios#`

Command Mode	Description

XR configuration mode	Performs feature configurations.
	Example:
	`RP/0/RP0/CPU0:ios# configure`
	`RP/0/RP0/CPU0:ios(config)#`

System Admin execution mode	Displays and monitors the operational state in System Admin mode. Example: `sysadmin-vm:0_RP0#`



CHAPTER 2

Bring-up Cisco NCS 1002

After installing the hardware, boot the Cisco NCS 1002 system. You can connect to the XR console port and power on the system. NCS 1002 completes the boot process using the pre-installed operating system (OS) image. If no image is available, NCS 1002 can be booted using the iPXE boot or an external bootable USB drive.

After booting, create the root username and password, and then use it to log on to the XR console. From the XR console, access the System Admin console to configure system administration settings.

Note The output of the examples in the procedures is not from the latest software release. The output will change for any explicit references to the current release.

Boot Sequence

The boot sequence in NCS 1002 that you need to follow is:

1. Boot using SSD (hard disk)
2. Boot using USB drive
3. Boot using iPXE

If there is no bootable image in all three boot options, reboot the system.

Boot NCS 1002

Use the console port to connect to NCS 1002. By default, the console port connects to the XR mode. If required, subsequent connections can be established through the management port, after it is configured.

Procedure

Step 1 Connect a terminal to the console port of the RP.

Step 2 Start the terminal emulation program on your workstation.

The console settings are 115200 bps, 8 data bits, 1 stop bit and no parity.

Step 3 Power on the NCS 1002.

To turn on the power shelves, press the power switch up. As NCS 1002 boots up, the boot process details are displayed at the console of the terminal emulation program.

Step 4 Press **Enter**.

The boot process is complete when the system prompts you to enter the root-system username. If the prompt does not appear, wait for a while to give the NCS 1002 more time to complete the initial boot procedure; then press **Enter**.

Important If the boot process fails, it may be because the pre-installed image on the NCS 1002 is corrupt. In this case, the NCS 1002 can be booted using an external bootable USB drive.

Boot NCS 1002 Using USB Drive

The bootable USB drive is used to re-image the NCS 1002 for the purpose of system upgrade or to boot the NCS 1002 in case of boot failure. A bootable USB drive is created by copying a compressed boot file into a USB drive. The USB drive becomes bootable after the contents of the compressed file are extracted.

This task can be completed using the Windows, Linux, or MAC operating systems available on your local machine. The exact operation to be performed for each generic step outlined here depends on the operating system in use.

Before you begin

- You need a USB drive with a storage capacity of at least 4 GB.
- NCS 1002 software image can be downloaded from this location.
- Copy the compressed boot file from the software download page at cisco.com to your local machine. The file name for the compressed boot file is in the format *ncs1k-usb-boot-<release_number>.zip*. For example, *ncs1k-usb-boot-6.3.2.zip*.

Procedure

Step 1 Connect the USB drive to your local machine and format it with the FAT32 file system.

Step 2 Copy the compressed boot file to the USB drive.

Step 3 Verify that the copy operation is successful. To verify, compare the file size at source and destination. Also, verify the MD5 checksum value.

Step 4 Extract the content of the compressed boot file by unzipping it in the USB drive. This makes the USB drive a bootable drive.

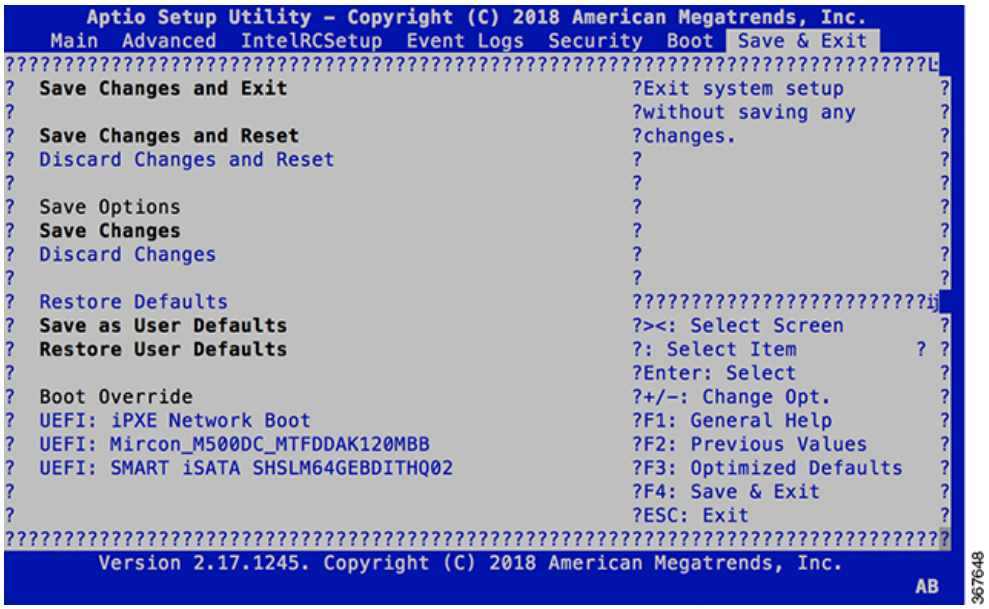
Note The content of the zipped file ("EFI" and "boot" directories) must be extracted directly in the root folder of the USB drive. If the unzipping application places the extracted files in a new folder, move the "EFI" and "boot" directories to the root folder of the USB drive.

Step 5 Insert the USB drive in one of the USB ports of NCS 1002.

Step 6 Reboot NCS 1002 using power cycle or console.

Step 7 Press Esc to enter BIOS.

Step 8 Select the **Save & Exit** tab of BIOS.



Step 9 Choose **UEFI based USB device**.

The system detects USB and boots the image from USB.

```
Admin Console:
GNU GRUB version 2.00
Press F2 to goto grub Menu..
Booting from USB..
Loading Kernel..

Validating End Entity Certificate...

Validating SubCA Certificate...

Validating Root Certificate...
```

```
Loading initrd..

Validating End Entity Certificate...

Validating SubCA Certificate...

Validating Root Certificate...
CiscoSec: Image signature verification completed.
XR Console:
CiscoSec: Image signature verified.
[    9.957281] i8042: No controller found
Starting udev
udevd[972]: failed to execute '/etc/udev/scripts/network.sh' '/etc/udev/scripts/network.sh':
 No such file or directory
Populating dev cache
Running postinst /etc/rpm-postinsts/100-dnsmasq...
update-rc.d: /etc/init.d/run-postinsts exists during rc.d purge (continuing)
 Removing any system startup links for run-postinsts ...
  /etc/rcS.d/S99run-postinsts
Configuring network interfaces... done.
```

Step 10 Remove the USB drive. The NCS 1002 reboots automatically.

```
Setting maximal mount count to -1
Setting interval between checks to 0 seconds
Fri Dec 11 20:35:56 UTC 2015: Install EFI on /dev/mb_disk4
Fri Dec 11 20:35:57 UTC 2015: Install finished on mb_disk
Rebooting system after installation ...
[  116.973666] reboot: Restarting system

Version 2.17.1245. Copyright (C) 2015 American Megatrends, Inc.
BIOS Date: 11/29/2015 12:02:45 Ver: 0ACBZ1110
Press <DEL> or <ESC> to enter setup.
CiscoSec: Image signature verified.


GNU GRUB version 2.00
Press F2 to goto grub Menu..
Booting from Disk..
Loading Kernel..

Validating End Entity Certificate...

Validating SubCA Certificate...

Validating Root Certificate...
Loading initrd..

Validating End Entity Certificate...

Validating SubCA Certificate...

Validating Root Certificate...
CiscoSec: Image signature verification completed.
Initrd, addr=0xff69a000, size=0x955cb0
[    1.745686] i8042: No controller found
```

Boot Using iPXE

iPXE is a pre-boot execution environment that is included in the network card of the management interfaces and works at the system firmware (UEFI) level of the chassis. iPXE is used to re-image the system, and boot the chassis in case of boot failure or in the absence of a valid bootable partition. iPXE downloads the ISO image, proceeds with the installation of the image, and finally bootstraps inside the new installation.

Note The time taken for iPXE to download the ISO image depends on the network speed. Ensure that the network speed is sufficient to complete the image download in less than 10 minutes. The chassis reloads if the image is not downloaded by 10 minutes.

iPXE acts as a boot loader and provides the flexibility to choose the image that the system will boot based on the Platform Identifier (PID), the Serial Number, or the management mac-address. iPXE must be defined in the DHCP server configuration file.

Note For IPv6 configuration, see **Step 2** in Setup DHCP Server, on page 7.

Setup DHCP Server

A DHCP server must be configured for IPv4, IPv6, or both communication protocols.

Note For DHCPv6, a routing advertisement (RA) message must be sent to all nodes in the network that indicates which method is to be used to obtain the IPv6 address. Configure Router-advertise-daemon (radvd, install using yum install radvd) to allow the client to send the DHCP request. For example:

```
interface eth3
{
        AdvSendAdvert on;
        MinRtrAdvInterval 60;
        MaxRtrAdvInterval 180;
        AdvManagedFlag on;
        AdvOtherConfigFlag on;
        prefix 2001:1851:c622:1::/64
        {
                AdvOnLink on;
                AdvAutonomous on;
                AdvRouterAddr off;
        };
};
```

To setup a DHCP server:

1. Create the `dhcpd.conf` file (for IPv4, IPv6 or both communication protocols), `dhcpv6.conf` file (for IPv6) or both in the `/etc/` directory. This configuration file stores the network information such as the path to the script, location of the ISO install file, location of the provisioning configuration file, serial number, MAC address of the chassis.

2. Test the server once the DHCP server is running:

   For example, for ipv4:

   a. Use MAC address of the chassis:

   ```
   host ncs1001
   {
   hardware ethernet ab:cd:ef:01:23:45;
   fixed-address <ip address>;
   filename "http://<httpserver-address>/<path-to-image>/ncs1001-mini-x.iso";
   }
   ```

   Ensure that the above configuration is successful.

   b. Use serial number of the chassis:

   ```
   host demo {
   option dhcp-client-identifier "<chassis-serial-number>";
     filename "http://<IP-address>/<hardware-platform>-mini-x.iso";
     fixed-address <IP-address>;
   }
   ```

   The serial number of the chassis is derived from the BIOS and is used as an identifier.

   Example

   ```
   host 10.89.205.202 {
          hardware ethernet 40:55:39:56:0c:e8;
             if exists user-class and option user-class = "iPXE" {
             filename "http://10.89.205.127/box1/ncs1001-mini-x-7.1.1.iso";
          } else {
              filename "http://10.89.205.127/box1/StartupConfig.cfg";
          }
          fixed-address 10.89.205.202;
       }
   ```

Boot Using iPXE

Before you use the iPXE boot, ensure that:

- DHCP server is set and is running.
- You have logged in to the System Admin console using the **admin** command.

Run the following command to invoke the iPXE boot process to reimage the chassis:

```
hw-module location all bootmedia network reload
```

Example:

```
sysadmin-vm:0_RP0# hw-module location all bootmedia network reload
Wed Dec 23 15:29:57.376 UTC
Reload hardware module ? [no,yes]
```

The following example shows the output of the command:

```
iPXE 1.0.0+ (3e573) -- Open Source Network Boot Firmware -- http://ipxe.org
Features: DNS HTTP TFTP VLAN EFI ISO9660 NBI Menu
Trying net0...
net0: c4:72:95:a6:14:e1 using dh8900cc on PCI01:00.1 (open)
[Link:up, TX:0 TXE:0 RX:0 RXE:0]
```

```
Configuring (net0 c4:72:95:a6:14:e1)................... Ok << Talking to DHCP/PXE server to
 obtain network information
net0: 10.37.1.101/255.255.0.0 gw 10.37.1.0
net0: fe80::c672:95ff:fea6:14e1/64
net0: 2001:1800:5000:1:c672:95ff:fea6:14e1/64 gw fe80::20c:29ff:fefb:b9fe
net1: fe80::c672:95ff:fea6:14e3/64 (inaccessible)
Next server: 10.37.1.235
Filename: http://10.37.1.235/ncs1001/ncs1001-mini-x.iso
http://10.37.1.235/ ... 58% << Downloading file as indicated by DHCP/PXE server to boot
install image
```

Boot Using ZTP

Zero Touch Provisioning (ZTP) is used to deploy minimal configurations on several chassis. ZTP is used to boot, set up, and configure the system. Configurations such as configuring the management ethernet interface, installing SMUs, applications, and optional packages can be automated using ZTP. ZTP does not execute if a user name is already configured in the system.

ZTP auto provisioning involves:

- **Configuration:** Downloads and executes the configuration files. The first line of the file must contain `!! IOS XR` for ZTP to process the file as a configuration.
- **Script:** Downloads and executes the script files. These script files include a programmatic approach to complete a task. For example, scripts created using IOS XR commands to perform patch upgrades. The first line of the file must contain `#! /bin/bash` or `#! /bin/sh` for ZTP to process the file as a script.

The user can either use the ZTP bash script or the ZTP configuration file.

```
host n1k {
  #hardware ethernet 00:a0:c9:00:00:00;
  option dhcp-client-identifier "<chassis-serial-number>";
     filename "http://<IP-address>/<folder>/ncs1k-ztp.script";
     #filename "http://<IP-address>/<folder>/ncs1k-ztp.cfg";
  }
```

The following is the sample content of the ZTP bash script.

```
#! /bin/bash
#
# NCS1K Demo Sample
# ZTP installation of config and day-0 SMU's
#
source ztp_helper

wget http://downloads.sourceforge.net/project/yourcode/application.tgz
#install the downloaded application.tgz

#Run XR CLI's from the script
`xrcmd "show version"`
```

The following is the sample content of the ZTP configuration file. The user can automate all the configurations such as configuring the management ethernet interface, slice provisioning, and so on.

```
!! IOS XR Configuration version = 6.3.2
!
telnet vrf default ipv4 server max-servers 20
!
```

```
vty-pool default 0 20 line-template default
!
interface MgmtEth0/RP0/CPU0/0
 ipv4 address dhcp
 no shutdown
!
router static
 address-family ipv4 unicast
  0.0.0.0/0 10.77.132.1
!
end
```

Boot NCS 1002 Using Golden ISO

Golden ISO is a feature provided to user for building customized ISO using mini ISO, required SMUs and IOS-XR configuration.

Before the introduction of Golden ISO feature, the user must perform the following three steps, to install a new image.

Step 1 : Boot the system with mini ISO. This can be done using iPXE or USB boot.

Step 2 : Install, add, and activate all the relevant SMUs/optional packages on to NCS 1002. NCS 1002 reloads on reload of any SMUs.

Step 3 : Apply IOS-XR configuration.

Benefits of Golden ISO

- Saves installation effort and time.
- System gets ready in a single command and single boot.

Golden ISO is built using ‘gisobuild.py’script, which is available at /pkg/bin/gisobuild.py location.

Limitations

- install operation over IPv6 is not supported.

Build Golden ISO

The following command is used to build Golden ISO:

```
/pkg/bin/gisobuild.py -i./ncs1k-mini-x.iso -r ./rpm_directory -c ./xr_config -1 V1
```

ncs1k-mini-x.iso - mini ISO of NCS 1002.

rpm_directory - Directory where SMUs (xr, calvados and host) are copied.

xr_config - IOS-XR configuration to be applied to system after booting.

V1 - Label of Golden ISO.

Note Golden ISO needs 6 GB free space to work. If 6 GB free space is not available, user gets the following error message.

```
"[xr-vm_node0_RP0_CPU0:/pkg/bin]$gisobuild.py -i/harddisk:/ncs1k-mini-x-6.5.2.26I.iso
-r/misc/disk1/ -1v2
Minimum 6 GB of free disk space is required for building Golden ISO.
Error: 2.35736465454 GB free disk space available in /pkg/bin"
```

The user must run the script under XR run prompt as follows:

[xr-vm_node0_RP0_CPU0:~]$

[xr-vm_node0_RP0_CPU0:~]$cd /run/

[xr-vm_node0_RP0_CPU0:/run]$gisobuild.py -i /harddisk:/ncs1k-mini-x-6.5.2.26I.iso -r /misc/disk1/ -l v2

System requirements check [PASS]

Golden ISO build process starting...

Platform: ncs1k Version: 6.5.2.26I

Scanning repository [/misc/disk1]...

Building RPM Database...

Total 1 RPM(s) present in the repository path provided in CLI

[1] ncs1k-k9sec-4.1.0.0-r65226I.x86_64.rpm

Following XR x86_64 rpm(s) will be used for building Golden ISO:

(+) ncs1k-k9sec-4.1.0.0-r65226I.x86_64.rpm

...RPM compatibility check [PASS]

Building Golden ISO...

Summary .....

XR rpms:

ncs1k-k9sec-4.1.0.0-r65226I.x86_64.rpm

...Golden ISO creation SUCCESS.

Golden ISO file is created in the following format:

platform-name-golden-x.iso-*version.label* (does not contain security(*k9sec*.rpm) rpm)

Example: ncs1k-golden-x-7.0.1.14I-V1.iso

platform-name-goldenk9-x.iso-*version.label* (contains security(*k9sec*.rpm) rpm)

Example: ncs1k-goldenk9-x-7.0.1.14I-V1.iso

Note Once the GISO file is created, please move the GISO file from the \run folder to the harddisk folder.

Boot NCS 1002 using the following procedure:

Step 1 : Install add source /harddisk:/ <space> ncs1k-goldenk9-x-7.0.1.126I-V2.iso

Install operation 1 started by root:

Install operation 1 finished successfully.

Here ID is 1.

Step 2 : Install activate id 1.

Step 3 : Install commit.

Verify Boot Operation

Procedure

Step 1 After the boot operation, reload the NCS 1002.

Step 2 **show version**

Example:

```
RP/0/RP0/CPU0:ios# show version
Wed Aug  8 16:10:20.694 IST
Cisco IOS XR Software, Version 6.5.1
Copyright (c) 2013-2018 by Cisco Systems, Inc.

Build Information:
Built By     : ahoang
Built On     : Mon Aug  6 14:00:31 PDT 2018
Built Host   : iox-ucs-023
Workspace    : /auto/srcarchive17/prod/6.5.1/ncs1k/ws
Version      : 6.5.1
Location     : /opt/cisco/XR/packages/

cisco NCS-1002 () processor
System uptime is 1 day 5 hours 15 minutes
```

Compare the displayed version with the boot image version. The versions need to be the same.

Access the System Admin Console

All system administration and hardware management setups are performed from the System Admin console.

Procedure

Step 1 Login to the XR console as the root user.

Step 2 **admin**

Example:

```
RP/0/RP0/CPU0:ios# admin
```

```
Wed Jul 29 18:05:14.280 UTC

root connected from 127.0.0.1 using console on xr-vm_node0_RP1_CPU0
sysadmin-vm:0_RP0#
```

After you enter the System Admin console, the prompt changes to:

```
sysadmin-vm:0_RP0#
```

Step 3 (Optional) **exit**

Example:

```
sysadmin-vm:0_RP0# exit


Wed Jul  29 18:05:15.994 UTC
RP/0/RP0/CPU0:ios#
```

Return to the XR CLI from the System Admin CLI.

Configure Management Interface

To use the management interface for system management and remote communication, you must configure an IP address and subnet mask for the management ethernet interface. To communicate with devices on other networks (such as remote management stations or TFTP servers), you need to configure a default (static) route for the NCS 1002.

The range of supported MTU of management plane is 64 to 1514 bytes.

Before you begin

- Consult your network administrator or system planner to procure IP addresses and a subnet mask for the management port.
- Ensure that the management port is connected to the management network.

Procedure

Step 1 **configure**

Example:

```
RP/0/RP0/CPU0:ios# configure
```

Enters XR Configuration mode.

Step 2 **interface mgmtEth** *rack/slot/instance/port*

Example:

```
RP/0/RP0/CPU0:ios(config)# interface mgmtEth 0/RP0/CPU0/0
```

Enters interface configuration mode for the management interface.

Step 3 **ipv4 address** *ipv4-address subnet-mask*

Example:

```
RP/0/RP0/CPU0:ios(config-if)# ipv4 address 10.1.1.1 255.0.0.0
```

Assigns an IP address and a subnet mask to the interface.

Step 4 **no shutdown**

Example:

```
RP/0/RP0/CPU0:ios(config-if)# no shutdown
```

Places the interface in an "up" state.

Step 5 **exit**

Example:

```
RP/0/RP0/CPU0:ios(config-if)# exit
```

Exits the Management interface configuration mode.

Step 6 **router static address-family ipv4 unicast** *0.0.0.0/0default-gateway*

Example:

```
RP/0/RP0/CPU0:ios(config)# router static address-family ipv4 unicast 0.0.0.0/0 198.51.100.2
```

Specifies the IP address of the default-gateway to configure a static route; this is to be used for communications with devices on other networks.

Step 7 Use the **commit** or **end** command.

commit-Saves the configuration changes and remains within the configuration session.

end-Prompts user to take one of these actions:

- **Yes**-Saves configuration changes and exits the configuration session.
- **No**-Exits the configuration session without committing the configuration changes.
- **Cancel**-Remains in the configuration session, without committing the configuration changes.

What to do next

Configure Telnet, on page 14 and Configure SSH, on page 15.

Configure Telnet

With a terminal emulation program, establish a telnet session to the management interface port using its IP address.

Procedure

Step 1 **configure**

Example:

```
RP/0/RP0/CPU0:ios# configure
```

Enters the Configuration mode.

Step 2 **telnet {ipv4 | ipv6} server max-servers** *limit*

Example:

```
RP/0/RP0/CPU0:ios(config)# telnet ipv4 server max-servers 10
```

Specifies the number of allowable Telnet servers. Up to 100 Telnet servers are allowed. By default, no Telnet servers are allowed. You must configure this command to enable the use of Telnet servers.

Step 3 Use the **commit** or **end** command.

commit-Saves the configuration changes and remains within the configuration session.

end-Prompts user to take one of these actions:

- **Yes**-Saves configuration changes and exits the configuration session.
- **No**-Exits the configuration session without committing the configuration changes.
- **Cancel**-Remains in the configuration session, without committing the configuration changes.

What to do next

Configure SSH, on page 15

Configure SSH

With a terminal emulation program, establish a SSH connection to the management interface port using its IP address.

Before you begin

- Install the ncs1k-k9sec package on the NCS 1002. For details about package installation, see Install Packages, on page 52.
- Generate the crypto key for SSH using the **crypto key generate dsa** command.

Procedure

Step 1 **configure**

Example:

```
RP/0/RP0/CPU0:ios# configure
```

Enters the Configuration mode.

Step 2 **ssh server v2**

Example:

```
RP/0/RP0/CPU0:ios(config)# ssh server v2
```

Enables the SSH server to accept only SSHv2 client connections.

Step 3 Use the **commit** or **end** command.

commit-Saves the configuration changes and remains within the configuration session.

end-Prompts user to take one of these actions:

- **Yes**-Saves configuration changes and exits the configuration session.
- **No**-Exits the configuration session without committing the configuration changes.
- **Cancel**-Remains in the configuration session, without committing the configuration changes.

Step 4 **show ssh session details**

Example:

```
RP/0/RP0/CPU0:ios# show ssh session details
```

Displays a detailed report of the SSHv2 connections to and from NCS 1002.

What to do next

Perform Clock Synchronization with NTP Server, on page 16

Perform Clock Synchronization with NTP Server

There are independent system clocks for the XR and the System Admin. To ensure that these clocks do not deviate from true time, they need to be synchronized with the clock of a NTP server. In this task you will configure a NTP server for the XR. After the XR clock is synchronized, the System Admin clock automatically synchronizes with the XR clock.

Before you begin

Configure and connect to the management port.

Procedure

Step 1 **configure**

Example:

```
RP/0/RP0/CPU0:ios# configure
```

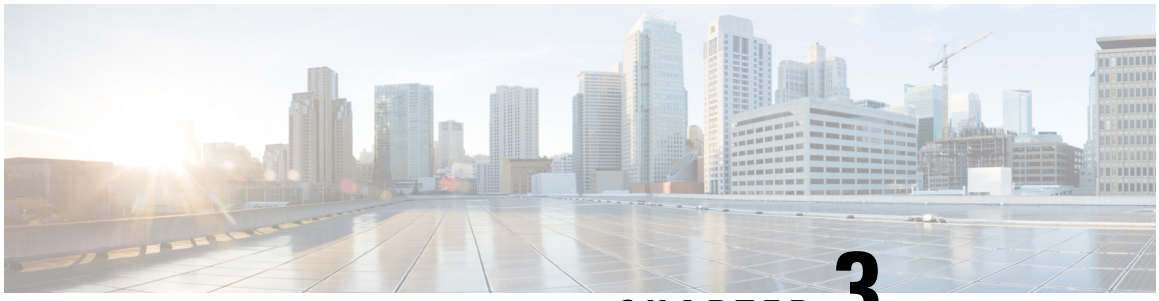
Enters XR Configuration mode.

Step 2 **ntp server** *server_address*

Example:

```
RP/0/RP0/CPU0:ios# ntp server 198.51.100.1
```

The XR clock is configured to be synchronized with the specified sever.



CHAPTER 3

Perform Preliminary Checks

After successfully logging into the console, you must perform some preliminary checks to verify the default setup. If any setup issue is detected when these checks are performed, take corrective action before making further configurations.

Note The output of the examples in the procedures is not from the latest software release. The output will change for any explicit references to the current release.

Verify Status of Hardware Components

To verify the status of all the hardware components installed on the NCS 1002, perform the following procedure.

Before you begin

Ensure that all the required hardware components have been installed on the NCS 1002. For installation details, see *Cisco Network Convergence System 1000 Series Hardware Installation Guide*.

Procedure

Step 1 **show platform**

When you execute this command from the Cisco IOS XR EXEC mode, the status of the Cisco IOS XR is displayed.

Verify that the node state is Operational and admin state is UP.

Example:

```
RP/0/RP0/CPU0:ios# show platform
Wed Feb 28 03:28:40.004 UTC
Node              Type                        State             Config state
--------------------------------------------------------------------------------
0/RP0/CPU0        NCS1K-CNTLR(Active)         IOS XR RUN        NSHUT
```

a) If the Cisco IOS XR is not operational, no output is shown in the result. In this case, verify the state of service domain router (SDR) on the node using the **show sdr** command in Cisco IOS XR mode.

The following example shows sample output from the **show sdr** command in Cisco IOS XR mode.

```
RP/0/RP0/CPU0:ios# show sdr
Wed Feb 28 03:28:45.845 UTC
Type                  NodeName       NodeState      RedState       PartnerName
------------------------------------------------------------------------------
RP                    0/RP0/CPU0     IOS XR RUN     ACTIVE         NONE
NCS1K-CNTLR           0/RP0          OPERATIONAL                   N/A
```

Step 2 **admin**

Enters System Admin EXEC mode.

Example:

```
RP/0/RP0/CPU0:ios# admin
```

Step 3 **show platform**

Displays information and status for each node in the system.

Example:

```
sysadmin-vm:0_RP0# show platform
Wed Feb  28 03:31:53.672 UTC
Location  Card Type               HW State      SW State      Config State
------------------------------------------------------------------------------
0/0       NCS1002-K9              OPERATIONAL   N/A           NSHUT
0/RP0     NCS1K-CNTLR             OPERATIONAL   OPERATIONAL   NSHUT
0/FT0     NCS1K-FTA               OPERATIONAL   N/A           NSHUT
0/FT1     NCS1K-FTA               OPERATIONAL   N/A           NSHUT
0/FT2     NCS1K-FTA               OPERATIONAL   N/A           NSHUT
```

Verify that all components of the NCS 1002 are displayed in the result. The software state and the hardware state must be in the OPERATIONAL state. The various hardware and software states are:

Hardware states:

- OPERATIONAL—Node is operating normally and is fully functional.
- POWERED_ON—Power is on and the node is booting up.
- FAILED—Node is powered on but has experienced some internal failure.
- PRESENT—Node is in the shutdown state.
- OFFLINE—User has changed the node state to OFFLINE. The node is accessible for diagnostics.

Software states:

- OPERATIONAL—Software is operating normally and is fully functional.

- SW_INACTIVE—Software is not completely operational.
- FAILED—Software is operational but the card has experienced some internal failure.

Step 4 **show platform detail**

Displays the hardware and software states, and other details of the node.

Example:

```
sysadmin-vm:0_RP0# show platform detail
Wed Feb  28 03:33:14.557 UTC

Platform Information for 0/0
 PID :               NCS1002-K9
 Description :       "Network Convergence System 1002 20 QSFP28/QSFP+ slots"
 VID/SN :            V01
 HW Oper State :     OPERATIONAL
 SW Oper State :     N/A
 Configuration :     "NSHUT RST"
 HW Version :        0.1
 Last Event :        HW_EVENT_OK
 Last Event Reason : "HW Event OK"

Platform Information for 0/RP0
 PID :               NCS1K-CNTLR
 Description :       "Network Convergence System 1000 Controller"
 VID/SN :            V03
 HW Oper State :     OPERATIONAL
 SW Oper State :     OPERATIONAL
 Configuration :     "NSHUT RST"
 HW Version :        0.1
 Last Event :        HW_EVENT_OK
 Last Event Reason : "HW Event OK"

Platform Information for 0/FT0
 PID :               NCS1K-FTA
 Description :       "Network Convergence System 1000 Fan"
 VID/SN :            V01
 HW Oper State :     OPERATIONAL
 SW Oper State :     N/A
 Configuration :     "NSHUT RST"
 HW Version :        0.1
 Last Event :        HW_EVENT_OK
 Last Event Reason : "HW Operational"

Platform Information for 0/FT1
 PID :               NCS1K-FTA
 Description :       "Network Convergence System 1000 Fan"
 VID/SN :            V01
 HW Oper State :     OPERATIONAL
 SW Oper State :     N/A
 Configuration :     "NSHUT RST"
 HW Version :        0.1
 Last Event :        HW_EVENT_OK
 Last Event Reason : "HW Operational"

Platform Information for 0/FT2
PID :               NCS1K-FTA
 Description :       "Network Convergence System 1000 Fan"
 VID/SN :            V01
 HW Oper State :     OPERATIONAL
 SW Oper State :     N/A
 Configuration :     "NSHUT RST"
```

```
 HW Version :        0.1
 Last Event :        HW_EVENT_OK
 Last Event Reason : "HW Operational"
```

Step 5 **show inventory**

Displays the details of the physical entities of the NCS 1002 along with the details of QSFPs and CFPs when you execute this command in the Cisco IOS XR EXEC mode.

Example:

```
RP/0/RP0/CPU0:ios# show inventory
Fri May 18 10:46:51.323 UTC
NAME: "0/0", DESCR: "Network Convergence System 1002 20 QSFP28/QSFP+ slots"
PID: NCS1002-K9        , VID: V03, SN: CAT2116B170

NAME: "0/0-Optics0/0/0/1", DESCR: "Non-Cisco QSFP28 100G LR4 Pluggable Optics Module"
PID: SPQCELRCDFB       , VID: 01 , SN: G9I2011804

NAME: "0/0-Optics0/0/0/4", DESCR: "Non-Cisco QSFP28 100G LR4 Pluggable Optics Module"
PID: TR-FC13L-N00      , VID: 01 , SN: INGAJ0930306

NAME: "0/0-Optics0/0/0/6", DESCR: "Cisco CFP2 DWDM Pluggable Optics"
PID: ONS-CFP2-WDM      , VID: V01 , SN: OUK1936006S

NAME: "0/0-Optics0/0/0/7", DESCR: "Cisco 4x10GE QSFP+ LR-S Pluggable Optics Module"
PID: QSFP-4X10G-LR-S   , VID: V02 , SN: INL20410069

NAME: "0/0-Optics0/0/0/8-LANE1", DESCR: "Cisco 10G SFP LR Pluggable Optics Module"
PID: SFP-10G-LR        , VID: V01 , SN: SPC1907074R

NAME: "0/0-Optics0/0/0/9", DESCR: "Cisco 40GE QSFP+ SR4 Pluggable Optics Module"
PID: QSFP-40G-SR4      , VID: V03 , SN: JFQ20332088

NAME: "0/0-Optics0/0/0/10", DESCR: "Non-Cisco QSFP28 100G LR4 Pluggable Optics Module"
PID: SPQCELRCDFB       , VID: 01 , SN: GAV2008935

NAME: "0/0-Optics0/0/0/11-LANE1", DESCR: "Cisco 10G SFP LR Pluggable Optics Module"
PID: SFP-10G-LR        , VID: V01 , SN: SPC190707YP

NAME: "0/0-Optics0/0/0/17-LANE1", DESCR: "Cisco 10G SFP SR Pluggable Optics Module"
PID: SFP-10G-SR        , VID: V03 , SN: JUR1904073P

NAME: "0/0-Optics0/0/0/18", DESCR: "Non-Cisco QSFP28 100G LR4 Pluggable Optics Module"
PID: FTLC1151RDPL      , VID: A0 , SN: UVE1C6C

NAME: "0/0-Optics0/0/0/19", DESCR: "Cisco CFP2 DWDM Pluggable Optics"
PID: ONS-CFP2-WDM      , VID: V05 , SN: OVE204404PA

NAME: "0/0-Optics0/0/0/21", DESCR: "Cisco 4x10GE QSFP+ LR-S Pluggable Optics Module"
PID: QSFP-4x10G-LR-S   , VID: V01 , SN: INL20200012

NAME: "0/0-Optics0/0/0/22-LANE1", DESCR: "Cisco 10G SFP LR Pluggable Optics Module"
PID: SFP-10G-LR        , VID: V01 , SN: SPC190707YS

NAME: "0/0-Optics0/0/0/23", DESCR: "Cisco 40GE QSFP+ SR4 Pluggable Optics Module"
PID: QSFP-40G-SR4      , VID: V03 , SN: JFQ2033201H

NAME: "0/0-Optics0/0/0/24", DESCR: "Non-Cisco QSFP28 100G LR4 Pluggable Optics Module"
PID: FTLC1151RDPL      , VID: A0 , SN: UWD2QMM

NAME: "0/0-Optics0/0/0/25-LANE1", DESCR: "Cisco 10G SFP ER Pluggable Optics Module"
PID: SFP-10G-ER        , VID: V02 , SN: ONT213100BW

NAME: "0/RP0", DESCR: "Network Convergence System 1000 Controller"
```

```
PID: NCS1K-CNTLR       , VID: V04, SN: CAT2052B0FZ

NAME: "Rack 0", DESCR: "Network Convergence System 1002 20 QSFP28/QSFP+ slots"
PID: NCS1002-K9        , VID: V03, SN: CAT2116B170

NAME: "0/FT0", DESCR: "Network Convergence System 1000 Fan"
PID: NCS1K-FTA         , VID: V01, SN: N/A

NAME: "0/FT1", DESCR: "Network Convergence System 1000 Fan"
PID: NCS1K-FTA         , VID: V01, SN: N/A

NAME: "0/FT2", DESCR: "Network Convergence System 1000 Fan"
PID: NCS1K-FTA         , VID: V01, SN: N/A

NAME: "0/PM0", DESCR: "Network Convergence System 1000 2KW AC PSU"
PID: NCS1K-2KW-AC      , VID: V01, SN: POG2041J0BW

NAME: "0/PM1", DESCR: "Network Convergence System 1000 2KW AC PSU"
PID: NCS1K-2KW-AC      , VID: V01, SN: POG2041J01C
```

You can verify if any QSFP or CFP has been removed from the NCS 1002.

Verify Node Status

You can verify the operational status of all the nodes using the **show platform** command. You can execute this command independently from both the Cisco IOS XR EXEC and System Admin EXEC modes.

To verify the operational status of all the nodes, perform the following procedure.

Procedure

Step 1 **show platform**

When you execute this command from the XR EXEC mode, the status of the Cisco IOS XR is displayed.

Verify that the node state is Operational and admin state is UP.

Example:

```
RP/0/RP0/CPU0:ios# show platform
Wed Feb 28 03:28:40.004 UTC
Node              Type                       State             Config state
--------------------------------------------------------------------------------
0/RP0/CPU0        NCS1K-CNTLR(Active)        IOS XR RUN        NSHUT
```

If the Cisco IOS XR is not operational, no output is shown in the result. In this case, verify the state of SDR on the node using the **show sdr** command in the System Admin EXEC mode.

Step 2 **admin**

Enters System Admin EXEC mode.

Example:

```
RP/0/RP0/CPU0:ios# admin
```

Step 3 **show platform**

Displays information and status for each node in the system.

Example:

```
sysadmin-vm:0_RP0# show platform
Wed Feb  28 03:31:53.672 UTC
Location  Card Type               HW State      SW State      Config State
--------------------------------------------------------------------------------
0/0       NCS1002-K9              OPERATIONAL   N/A           NSHUT
0/RP0     NCS1K-CNTLR             OPERATIONAL   OPERATIONAL   NSHUT
0/FT0     NCS1K-FTA               OPERATIONAL   N/A           NSHUT
0/FT1     NCS1K-FTA               OPERATIONAL   N/A           NSHUT
0/FT2     NCS1K-FTA               OPERATIONAL   N/A           NSHUT
```

Verify that all the modules of the NCS 1002 are displayed in the result. The software state and the hardware state must be in the OPERATIONAL state. The various hardware and software states are:

Hardware states:

- OPERATIONAL—Node is operating normally and is fully functional.
- POWERED_ON—Power is on and the node is booting up.
- FAILED—Node is powered on but has experienced some internal failure.
- PRESENT—Node is in the shutdown state.
- OFFLINE—User has changed the node state to OFFLINE. The node is accessible for diagnostics.

Software states:

- OPERATIONAL—Software is operating normally and is fully functional.
- DIAG_MODE—User has changed the card state to OFFLINE for diagnosis.
- SW_INACTIVE—Software is not completely operational.
- FAILED—Software is operational but the card has experienced some internal failure.

Step 4 **show platform detail**

Displays the hardware and software states, and other details of the node.

Example:

```
sysadmin-vm:0_RP0# show platform detail
Wed Feb  28 03:33:14.557 UTC

Platform Information for 0/0
 PID :               NCS1002-K9
 Description :       "Network Convergence System 1002 20 QSFP28/QSFP+ slots"
 VID/SN :            V01
 HW Oper State :     OPERATIONAL
 SW Oper State :     N/A
 Configuration :     "NSHUT RST"
 HW Version :        0.1
 Last Event :        HW_EVENT_OK
 Last Event Reason : "HW Event OK"

Platform Information for 0/RP0
 PID :               NCS1K-CNTLR
 Description :       "Network Convergence System 1000 Controller"
 VID/SN :            V03
 HW Oper State :     OPERATIONAL
```

```
 SW Oper State :     OPERATIONAL
 Configuration :     "NSHUT RST"
 HW Version :        0.1
 Last Event :        HW_EVENT_OK
 Last Event Reason : "HW Event OK"

Platform Information for 0/FT0
 PID :               NCS1K-FTA
 Description :       "Network Convergence System 1000 Fan"
 VID/SN :            V01
 HW Oper State :     OPERATIONAL
 SW Oper State :     N/A
 Configuration :     "NSHUT RST"
 HW Version :        0.1
 Last Event :        HW_EVENT_OK
 Last Event Reason : "HW Operational"

Platform Information for 0/FT1
 PID :               NCS1K-FTA
 Description :       "Network Convergence System 1000 Fan"
 VID/SN :            V01
 HW Oper State :     OPERATIONAL
 SW Oper State :     N/A
 Configuration :     "NSHUT RST"
 HW Version :        0.1
 Last Event :        HW_EVENT_OK
 Last Event Reason : "HW Operational"

Platform Information for 0/FT2
PID :               NCS1K-FTA
 Description :       "Network Convergence System 1000 Fan"
 VID/SN :            V01
 HW Oper State :     OPERATIONAL
 SW Oper State :     N/A
 Configuration :     "NSHUT RST"
 HW Version :        0.1
 Last Event :        HW_EVENT_OK
 Last Event Reason : "HW Operational"
```

Verify Software Version

The NCS 1002 is shipped with the Cisco IOS XR software pre-installed. Verify that the latest version of the software is installed. If a newer version is available, perform a system upgrade. This will install the newer version of the software and provide the latest feature set on the NCS 1002.

To verify the version of Cisco IOS XR software running on the NCS 1002, perform the following procedure.

Procedure

show version

Displays the software version and details such as system uptime.

Example:

```
RP/0/RP0/CPU0:ios# show version
Wed Feb 10 19:35:38.274 IST
```

```
Cisco IOS XR Software, Version 7.3.2
Copyright (c) 2013-2021 by Cisco Systems, Inc.

Build Information:
 Built By     : ingunawa
 Built On     : Tue Feb  9 11:45:12 PST 2021
 Built Host   : iox-lnx-068
 Workspace    : /auto/iox-lnx-068-san1/prod/7.3.2/ncs1k/ws
 Version      : 7.3.2
 Location     : /opt/cisco/XR/packages/
 Label        : 7.3.2

cisco NCS-1002 () processor
System uptime is 3 hours 37 minutes
```

What to do next

Verify the result to ascertain whether a system upgrade is required. If the upgrade is required, see the Perform System Upgrade and Install Feature Packages, on page 49 chapter.

Verify Firmware Version

The firmware on various hardware components of the NCS 1002 must be compatible with the installed Cisco IOS XR image. Incompatibility may cause the NCS 1002 to malfunction.

To verify the firmware version, perform the following procedure.

Procedure

Step 1 **show hw-module fpd**

```
Wed Feb 10 19:35:29.371 IST

Auto-upgrade:Disabled
                                                                  FPD Versions
                                                                  ================
Location   Card type              HWver FPD device       ATR Status   Running Programd
-------------------------------------------------------------------------------------
0/0        NCS1002-K9             1.2   CDSP_PORT_05         CURRENT    3.77    3.77
0/0        NCS1002-K9             1.2   CDSP_PORT_06         CURRENT    3.77    3.77
0/0        NCS1002-K9             1.2   CDSP_PORT_12         CURRENT    3.77    3.77
0/0        NCS1002-K9             1.2   CDSP_PORT_13         CURRENT    3.77    3.77
0/0        NCS1002-K9             1.2   CDSP_PORT_19         CURRENT    3.77    3.77
0/0        NCS1002-K9             1.2   CDSP_PORT_20         CURRENT    3.77    3.77
0/0        NCS1002-K9             1.2   CDSP_PORT_26         CURRENT    3.77    3.77
0/0        NCS1002-K9             1.2   CDSP_PORT_27         CURRENT    3.77    3.77
0/0        NCS1002-K9             2.0   CFP2_PORT_05         CURRENT    4.40    4.40
0/0        NCS1002-K9             2.1   CFP2_PORT_06         CURRENT    5.52    5.52
0/0        NCS1002-K9             2.1   CFP2_PORT_12         CURRENT    5.52    5.52
0/0        NCS1002-K9             0.0   CFP2_PORT_13         CURRENT    1.01    1.01
0/0        NCS1002-K9             2.1   CFP2_PORT_19         CURRENT    5.52    5.52
0/0        NCS1002-K9             2.1   CFP2_PORT_20         CURRENT    5.52    5.52
0/0        NCS1002-K9             4.2   CFP2_PORT_26         CURRENT    3.20    3.20
0/0        NCS1002-K9             2.1   CFP2_PORT_27         CURRENT    5.52    5.52
0/0        NCS1002-K9             0.1   CTRL_BKP_LOW     B   CURRENT            2.23
```

```
0/0         NCS1002-K9            0.1   CTRL_BKP_UP      B   CURRENT           2.23
0/0         NCS1002-K9            0.1   CTRL_FPGA_LOW        CURRENT    2.23   2.23
0/0         NCS1002-K9            0.1   CTRL_FPGA_UP         CURRENT    2.23   2.23
0/RP0       NCS1K-CNTLR           0.1   BIOS_Backup      BS  CURRENT          15.10
0/RP0       NCS1K-CNTLR           0.1   BIOS_Primary      S  CURRENT   15.10  15.10
0/RP0       NCS1K-CNTLR           0.1   Daisy_Duke_BKP   BS  CURRENT           0.20
0/RP0       NCS1K-CNTLR           0.1   Daisy_Duke_FPGA   S  CURRENT    0.20   0.20
0/PM0       NCS1K-2KW-AC          0.0   PO-PriMCU            CURRENT    4.00   4.00
0/PM1       NCS1K-2KW-AC          0.0   PO-PriMCU            CURRENT    4.00   4.00
```

Displays the firmware information of various hardware components of the NCS 1002 in the Cisco IOS XR EXEC mode.

In the above output, some of the significant fields are:

- FPD Device—Name of the hardware component such as FPD, CFP, and so on.
- ATR—Attribute of the hardware component. Some of the attributes are:
  - B—Backup Image
  - S—Secure Image
  - P—Protected Image
- Status— Upgrade status of the firmware. The different states are:
  - CURRENT—The firmware version is the latest version.
  - READY—The firmware of the FPD is ready for an upgrade.
  - NOT READY—The firmware of the FPD is not ready for an upgrade.
  - NEED UPGD—A newer firmware version is available in the installed image. It is recommended that an upgrade be performed.
  - RLOAD REQ—The upgrade has been completed, and the ISO image requires a reload.
  - UPGD DONE—The firmware upgrade is successful.
  - UPGD FAIL— The firmware upgrade has failed.
  - BACK IMG—The firmware is corrupted. Reinstall the firmware.
  - UPGD SKIP—The upgrade has been skipped because the installed firmware version is higher than the one available in the image.
- Running—Current version of the firmware running on the FPD.

Step 2 **show hw-module slice** *slice_number*

Displays the slice and Datapath FPGA (DP-FPGA) information of the NCS 1002.

Example:

```
  RP/0/RP0/CPU0:ios# show hw-module slice 0
Wed Feb 28 04:01:45.828 UTC
Slice ID:               0
Status:                 Provisioned
Client Bitrate:         10
Trunk Bitrate:          100
DP FPGA FW Type:        XMG1
```

```
DP FPGA FW Version:      01.01
HW Status:               CURRENT

Encryption Supported:    FALSE
LLDP Drop Enabled:       FALSE
Client Port -   Trunk Port          CoherentDSP0/0/0/5   CoherentDSP0/0/0/6
Traffic Split Percentage

TenGigECtrlr0/0/0/0/1                            100                    0
TenGigECtrlr0/0/0/0/2                            100                    0
TenGigECtrlr0/0/0/0/3                            100                    0
TenGigECtrlr0/0/0/0/4                            100                    0
TenGigECtrlr0/0/0/1/1                            100                    0
TenGigECtrlr0/0/0/1/2                            100                    0
TenGigECtrlr0/0/0/1/3                            100                    0
TenGigECtrlr0/0/0/1/4                            100                    0
TenGigECtrlr0/0/0/2/1                              0                  100
TenGigECtrlr0/0/0/2/2                              0                  100
TenGigECtrlr0/0/0/2/3                            100                    0
TenGigECtrlr0/0/0/2/4                            100                    0
TenGigECtrlr0/0/0/3/1                              0                  100
TenGigECtrlr0/0/0/3/2                              0                  100
TenGigECtrlr0/0/0/3/3                              0                  100
TenGigECtrlr0/0/0/3/4                              0                  100
TenGigECtrlr0/0/0/4/1                              0                  100
TenGigECtrlr0/0/0/4/2                              0                  100
TenGigECtrlr0/0/0/4/3                              0                  100
TenGigECtrlr0/0/0/4/4                              0                  100
```

In the above output, DP FPGA Version indicates the image of the datapath FPGA. Here, F-203 is the image version of the 40 G image. The CURRENT value of the HW Status parameter indicates that the firmware version is the latest.

When the DP FPGA Version is T, it indicates 10 G. If the DP FPGA Version is H, it indicates 100 G image versions. If Need UPG appears in the output, you must upgrade the slice to get the updated DP FPGA using the **upgrade hw-module slice** *slice_number* **re-provision** command.

What to do next

Upgrading the Firmware Version of Hardware Components

Notes for Release 6.0.1

- You can upgrade the firmware version of the power modules, BIOS, CFP2, or Coherent DSP of the NCS 1002. For details on upgrading the firmware version of the power modules, see Upgrading the Firmware, on page 60
- You can upgrade both BIOS_Primary and BIOS_Backup.
- You can upgrade the BIOS_Backup only if the Programmed FPD version of the Daisy Duke FPGA is 0.15. If the FPD version of the Daisy Duke FPGA is not 0.15, the state of the BIOS_Backup is NOT READY state.

  Use this procedure to upgrade BIOS_Backup.

  1. Upgrade Daisy Duke FPGA.
  2. Use the reload command to activate Daisy Duke FPGA.
  3. Use the upgrade command to upgrade BIOS_Backup separately.

Use the **show fpd package** command to display the FPD image version available with this software release for each hardware component.

```
sysadmin-vm:0_RP0# show fpd package
Wed Feb  28 03:35:19.382 UTC

================================ ============================================
                                        Field Programmable Device Package
                                 ============================================
                                           Req      SW       Min Req   Min Req
Card Type            FPD Description       Reload   Ver      SW Ver    Board Ver
================== ========================== ====== ======= ======== =========
NCS1002              CTRL_BKP_LOW               YES     2.23      2.23       0.1
                     CTRL_FPGA_LOW              YES     2.23      2.23       0.1
--------------------------------------------------------------------------------
NCS1002              CTRL_BKP_UP                YES     2.23      2.23       0.1
                     CTRL_FPGA_UP               YES     2.23      2.23       0.1
NCS1002--RP          BIOS_Backup                YES    14.00     14.00       0.1
                     BIOS_Primary               YES    14.00     14.00       0.1
                     Daisy_Duke_BKP             YES     0.15      0.15       0.1
                     Daisy_Duke_FPGA            YES     0.17      0.17       0.1
--------------------------------------------------------------------------------
```

Upgrade all the FPDs using the **upgrade hw-module location all fpd all** command in the Cisco IOS XR EXEC mode. After an upgrade is completed, the Status column shows RLOAD REQ if the software requires reload.

If Reload is Required

If the FPGA location is 0/RP0, use the **admin hw-module location 0/RP0 reload** command. This command reboots only the CPU. As a result, traffic is not impacted. If the FPGA location is 0/0, use the **admin hw-module location all reload** command. This command reboots the chassis. As a result, traffic is impacted. After the reload is completed, the new FPGA runs the current version.

If Firmware Upgrade Fails

If the firmware upgrade fails, use the **show logging** command to view the details and upgrade the firmware again using the above commands.

Notes for Release 6.1.2

NCS 1002 uses signed images from R6.1.2. Hence, the firmware must be upgraded to identify the signed images. When the user needs to use the MACsec feature and upgrades from R6.0.1 to 6.1.2, the control FPGA (CTRL_BKP_UP, CTRL_BKP_LOW, CTRL_FPGA_UP, and CTRL_FPGA_LOW) must be upgraded to the latest firmware version provided by R6.1.2.

Verify Management Interface Status

To verify the management interface status, perform the following procedure.

Procedure

show interfaces mgmtEth *instance*

Displays the management interface configuration.

Example:

```
RP/0/RP0/CPU0:ios# show interfaces MgmtEth 0/RP0/CPU0/0
 Wed Feb 28 03:30:35.525 UTC
MgmtEth0/RP0/CPU0/0 is up, line protocol is up
  Interface state transitions: 1
  Hardware is Management Ethernet, address is 501c.bf10.9fc0 (bia 501c.bf10.9fc0)
  Internet address is 10.77.132.68/24
  MTU 1514 bytes, BW 100000 Kbit (Max: 100000 Kbit)
     reliability 255/255, txload 0/255, rxload 0/255
  Encapsulation ARPA,
  Full-duplex, 100Mb/s, CX, link type is autonegotiation
  loopback not set,
  Last link flapped 1d21h
  ARP type ARPA, ARP timeout 04:00:00
  Last input 00:00:00, output 00:02:38
  Last clearing of "show interface" counters never
  5 minute input rate 2000 bits/sec, 4 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
     852455 packets input, 58601651 bytes, 0 total input drops
     0 drops for unrecognized upper-level protocol
     Received 560680 broadcast packets, 290268 multicast packets
              0 runts, 0 giants, 0 throttles, 0 parity
     0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
     1561 packets output, 93270 bytes, 0 total output drops
     Output 0 broadcast packets, 0 multicast packets
     0 output errors, 0 underruns, 0 applique, 0 resets
     0 output buffer failures, 0 output buffers swapped out
     1 carrier transitions
```

In the above result, the management interface is administratively down.

You can also use the **show interfaces summary** and **show interfaces brief** commands in the Cisco IOS XR EXEC mode to verify the management interface status.

- The following example shows sample output from the **show interfaces summary** command.

```
RP/0/RP0/CPU0:ios# show interfaces summary
Wed Feb 28 03:30:41.991 UTC
Interface Type          Total    UP       Down     Admin Down
--------------          -----    --       ----     ----------
ALL TYPES               4        2        0        2
--------------
IFT_ETHERNET            3        1        0        2
IFT_NULL                1        1        0        0
```

- The following example shows sample output from the **show interfaces brief** command.

```
RP/0/RP0/CPU0:ios# show interfaces brief
Wed Feb 28 03:30:47.996 UTC

               Intf       Intf        LineP              Encap  MTU        BW
               Name       State       State               Type (byte)    (Kbps)
-------------------------------------------------------------------------------
                Nu0          up          up               Null  1500          0
     Mg0/RP0/CPU0/0          up          up               ARPA  1514     100000
     Mg0/RP0/CPU0/1  admin-down  admin-down               ARPA  1514    1000000
     Mg0/RP0/CPU0/2  admin-down  admin-down               ARPA  1514    1000000
```

What to do next

If the management interface is administratively down, perform the following steps:

- Check the Ethernet cable connection.
- Verify the IP configuration of the management interface. For details on configuring the management interface, see the *Bring-up NCS 1002* chapter.
- Verify whether the management interface is in the no shut state using the **show running-config interface mgmtEth** command.

  The following example shows sample output from the **show running-config interface mgmtEth** command.

```
RP/0/RP0/CPU0:ios#show running-config interface mgmtEth 0/RP0/CPU0/0
Fri Nov 13 19:42:54.368 UTC
interface MgmtEth0/RP0/CPU0/0
 ipv4 address 10.58.227.183 255.255.255.0

!
```

  In the above output, the management interface is in the no shut state.

Verify Alarms

You can view the alarm information using the **show alarms** command.

Procedure

show alarms [**brief** [**card | rack | system**] [**location** *location*] [**active | history**] | **detail** [**card | rack | system**] [**location** *location*] [**active | clients | history | stats**]]

Displays alarms in brief or detail.

Example:

```
RP/0/RP0/CPU0:ios# show alarms brief card location 0/RP0/CPU0 active

Thu Mar  8 17:51:47.237 UTC

------------------------------------------------------------------------------------
Active Alarms
------------------------------------------------------------------------------------
Location        Severity     Group            Set Time                    Description



------------------------------------------------------------------------------------
0/0             Minor        Slice            03/07/2018 07:33:43 UTC    Encrypted Slice
Is Provisioned Without K9sec Package Or K9sec Package Incomplete


0/0             Critical     Controller       03/07/2018 07:37:19 UTC    Optics0/0/0/10 -
Improper Removal


0/0             Critical     Controller       03/07/2018 07:38:17 UTC    Optics0/0/0/2 -
Improper Removal


0/0             Critical     Controller       03/07/2018 07:38:17 UTC    Optics0/0/0/3 -
```

```
Improper Removal

0/0             Major        Ethernet         03/07/2018 08:36:11 UTC
HundredGigECtrlr0/0/0/11 - Remote Fault

0/0             Critical     Controller       03/07/2018 08:39:27 UTC    Optics0/0/0/24 -
Improper Removal

0/0             Major        Ethernet         03/07/2018 08:39:28 UTC
HundredGigECtrlr0/0/0/25 - Remote Fault

0/0             Critical     Controller       03/07/2018 08:40:40 UTC    Optics0/0/0/16 -
Improper Removal

0/0             Critical     Controller       03/07/2018 08:40:40 UTC    Optics0/0/0/17 -
Improper Removal

0/0             Major        Ethernet         03/07/2018 08:40:51 UTC
TenGigECtrlr0/0/0/18/4 - Remote Fault

0/0           Major       Ethernet        03/07/2018 08:36:14 UTC    TenGigECtrlr0/0/0/4/2
 - Remote Fault

0/0             Major        Ethernet         03/07/2018 20:37:16 UTC
TenGigECtrlr0/0/0/18/2 - Remote Fault

0/0           Major       Ethernet        03/07/2018 08:36:12 UTC    TenGigECtrlr0/0/0/4/4
 - Remote Fault

0/0           Major       Ethernet        03/08/2018 17:51:34 UTC    TenGigECtrlr0/0/0/4/3
 - Loss of Synchronization The Data Interface

0/0             Major        Ethernet         03/08/2018 17:51:34 UTC
TenGigECtrlr0/0/0/18/3 - Loss of Synchronization The Data Interface

0/0           Major       Ethernet        03/07/2018 08:36:12 UTC    TenGigECtrlr0/0/0/4/1
 - Remote Fault

0/0             Major        Ethernet         03/07/2018 08:40:50 UTC
TenGigECtrlr0/0/0/18/1 - Remote Fault
```

What to do next

For more information about alarms and steps to clear them, see the *Alarm Troubleshooting* chapter of the *Cisco NCS 1000 Series Troubleshooting Guide*.

Verify Environmental Parameters

The **show environment** command displays the environmental parameters of the NCS 1002.

To verify that the environmental parameters are as expected, perform the following procedure.

Procedure

Step 1 **admin**

Enters System Admin EXEC mode.

Example:

```
RP/0/RP0/CPU0:ios# admin
```

Step 2 **show environment** [**all** | **fan** | **power** | **voltages** | **current** | **temperatures**] [**location** | *location*]

Displays the environmental parameters of the NCS 1002.

Example:

The following example shows sample output from the **show environment** command with the **fan** keyword.

```
sysadmin-vm:0_RP0# show environment fan
Wed Feb  28 03:34:08.625 UTC
=====================================
                        Fan speed (rpm)
Location     FRU Type           FAN_0
-------------------------------------
0/FT0        NCS1K-FTA           5400
0/FT1        NCS1K-FTA           5340
0/FT2        NCS1K-FTA           5460
0/PM0        NCS1K-2KW-AC           0
0/PM1        NCS1K-2KW-AC        9664
```

The following example shows sample output from the **show environment** command with the **temperatures** keyword.

```
sysadmin-vm:0_RP0# show environment temperatures location 0/RP0
Wed Feb  28 03:34:16.110 UTC
================================================================================
Location  TEMPERATURE                Value   Crit Major Minor Minor Major  Crit
          Sensor                  (deg C)    (Lo) (Lo)  (Lo)  (Hi)  (Hi)   (Hi)
--------------------------------------------------------------------------------
0/RP0
          Thermistor 1                 32    -10     0     0    55    55    85
          Thermistor 2                 32    -10     0     0    55    55    85
          Hot Spot Temperature         31    -10     0     0    55    55    85
```

The following example shows sample output from the **show environment** command with the **power** keyword.

```
sysadmin-vm:0_RP0# show environment power
Wed Feb  28 03:34:28.920 UTC
================================================================================
CHASSIS LEVEL POWER INFO: 0
================================================================================
   Total output power capacity (N + 1)             :    2000W +       0W
   Total output power required                     :     975W
```

```
   Total power input                               :     272W
   Total power output                              :     227W

Power Group 0:
================================================================================
   Power       Supply     ------Input----   ------Output---      Status
   Module      Type        Volts     Amps    Volts     Amps
================================================================================
   0/PM0       2kW-AC        0.0      0.0     12.0      0.0    FAILED or NO PWR

Total of Power Group 0:      0W/      0.0A    0W/       0.0A

Power Group 1:
================================================================================
   Power       Supply     ------Input----   ------Output---      Status
   Module      Type        Volts     Amps    Volts     Amps
================================================================================
   0/PM1       2kW-AC      226.5      1.2     12.0     18.9    OK
Total of Power Group 1:    272W/      1.2A    227W/    18.9A

================================================================================
   Location     Card Type             Power       Power       Status
                                      Allocated   Used
                                      Watts       Watts
================================================================================
   0/0          NCS1002-K9             820          -       ON
   0/RP0        NCS1K-CNTLR             35          -       ON
   0/FT0        NCS1K-FTA               40          -       ON
   0/FT1        NCS1K-FTA               40          -       ON
   0/FT2        NCS1K-FTA               40          -       ON
```

The following example shows sample output from the **show environment** command with the **voltages** keyword.

```
sysadmin-vm:0_RP0# show environment voltages location 0/RP0
Wed Feb  28 03:34:34.750 UTC
================================================================================
Location  VOLTAGE                    Value   Crit Minor Minor  Crit
          Sensor                     (mV)    (Lo) (Lo)  (Hi)   (Hi)
--------------------------------------------------------------------------------
0/RP0
          VP1P0_CPU                  1001    900   950  1050  1100
          CPU_CORE_VCC                705    400   450  1350  1400
          CPU_CORE_VNN                943    400   450  1350  1400
          VP1P1                      1074    990  1050  1160  1210
          VP1P2                      1203   1080  1140  1260  1320
          VP1P35_DDR                 1347   1220  1280  1420  1490
          VP1P35                     1346   1220  1280  1420  1490
          VP1P5                      1502   1350  1430  1580  1650
          VP1P8_CPU                  1798   1620  1710  1890  1980
          VP3P3_STBY                 3318   2970  3140  3470  3630
          VP3P3                      3346   2970  3140  3470  3630
          VP5P0                      5013   4500  4750  5250  5500
          VP12P0                    11992  10800 11400 12600 13200
          VREF                       1219   1190  1200  1240  1250
          12V Input Voltage         11154   8000 10000 14000 16000
```

What to do next

Environment parameter anomalies are logged in the syslog. As a result, if an environment parameter displayed in the **show environment** command output is not as expected, check the syslog using the **show logging** command. The syslog provides details on any logged problems.

Verify Inventory

The **show inventory** command displays details of the hardware inventory of the NCS 1002.

To verify the inventory information for all the physical entities, perform the following procedure.

Procedure

Step 1 **show inventory**

Displays the details of the NCS 1002 when you execute this command in the Cisco IOS XR EXEC mode.

Example:

```
RP/0/RP0/CPU0:ios# show inventory
Fri May 18 10:46:51.323 UTC
NAME: "0/0", DESCR: "Network Convergence System 1002 20 QSFP28/QSFP+ slots"
PID: NCS1002-K9        , VID: V03, SN: CAT2116B170

NAME: "0/0-Optics0/0/0/1", DESCR: "Non-Cisco QSFP28 100G LR4 Pluggable Optics Module"
PID: SPQCELRCDFB       , VID: 01 , SN: G9I2011804

NAME: "0/0-Optics0/0/0/4", DESCR: "Non-Cisco QSFP28 100G LR4 Pluggable Optics Module"
PID: TR-FC13L-N00      , VID: 01 , SN: INGAJ0930306

NAME: "0/0-Optics0/0/0/6", DESCR: "Cisco CFP2 DWDM Pluggable Optics"
PID: ONS-CFP2-WDM      , VID: V01 , SN: OUK1936006S

NAME: "0/0-Optics0/0/0/7", DESCR: "Cisco 4x10GE QSFP+ LR-S Pluggable Optics Module"
PID: QSFP-4X10G-LR-S   , VID: V02 , SN: INL20410069

NAME: "0/0-Optics0/0/0/8-LANE1", DESCR: "Cisco 10G SFP LR Pluggable Optics Module"
PID: SFP-10G-LR        , VID: V01 , SN: SPC1907074R

NAME: "0/0-Optics0/0/0/9", DESCR: "Cisco 40GE QSFP+ SR4 Pluggable Optics Module"
PID: QSFP-40G-SR4      , VID: V03 , SN: JFQ20332088

NAME: "0/0-Optics0/0/0/10", DESCR: "Non-Cisco QSFP28 100G LR4 Pluggable Optics Module"
PID: SPQCELRCDFB       , VID: 01 , SN: GAV2008935

NAME: "0/0-Optics0/0/0/11-LANE1", DESCR: "Cisco 10G SFP LR Pluggable Optics Module"
PID: SFP-10G-LR        , VID: V01 , SN: SPC190707YP

NAME: "0/0-Optics0/0/0/17-LANE1", DESCR: "Cisco 10G SFP SR Pluggable Optics Module"
PID: SFP-10G-SR        , VID: V03 , SN: JUR1904073P

NAME: "0/0-Optics0/0/0/18", DESCR: "Non-Cisco QSFP28 100G LR4 Pluggable Optics Module"
PID: FTLC1151RDPL      , VID: A0 , SN: UVE1C6C

NAME: "0/0-Optics0/0/0/19", DESCR: "Cisco CFP2 DWDM Pluggable Optics"
PID: ONS-CFP2-WDM      , VID: V05 , SN: OVE204404PA
```

```
NAME: "0/0-Optics0/0/0/21", DESCR: "Cisco 4x10GE QSFP+ LR-S Pluggable Optics Module"
PID: QSFP-4x10G-LR-S   , VID: V01 , SN: INL20200012

NAME: "0/0-Optics0/0/0/22-LANE1", DESCR: "Cisco 10G SFP LR Pluggable Optics Module"
PID: SFP-10G-LR        , VID: V01 , SN: SPC190707YS

NAME: "0/0-Optics0/0/0/23", DESCR: "Cisco 40GE QSFP+ SR4 Pluggable Optics Module"
PID: QSFP-40G-SR4      , VID: V03 , SN: JFQ2033201H

NAME: "0/0-Optics0/0/0/24", DESCR: "Non-Cisco QSFP28 100G LR4 Pluggable Optics Module"
PID: FTLC1151RDPL      , VID: A0 , SN: UWD2QMM

NAME: "0/0-Optics0/0/0/25-LANE1", DESCR: "Cisco 10G SFP ER Pluggable Optics Module"
PID: SFP-10G-ER        , VID: V02 , SN: ONT213100BW

NAME: "0/RP0", DESCR: "Network Convergence System 1000 Controller"
PID: NCS1K-CNTLR       , VID: V04, SN: CAT2052B0FZ

NAME: "Rack 0", DESCR: "Network Convergence System 1002 20 QSFP28/QSFP+ slots"
PID: NCS1002-K9        , VID: V03, SN: CAT2116B170

NAME: "0/FT0", DESCR: "Network Convergence System 1000 Fan"
PID: NCS1K-FTA         , VID: V01, SN: N/A

NAME: "0/FT1", DESCR: "Network Convergence System 1000 Fan"
PID: NCS1K-FTA         , VID: V01, SN: N/A

NAME: "0/FT2", DESCR: "Network Convergence System 1000 Fan"
PID: NCS1K-FTA         , VID: V01, SN: N/A

NAME: "0/PM0", DESCR: "Network Convergence System 1000 2KW AC PSU"
PID: NCS1K-2KW-AC      , VID: V01, SN: POG2041J0BW

NAME: "0/PM1", DESCR: "Network Convergence System 1000 2KW AC PSU"
PID: NCS1K-2KW-AC      , VID: V01, SN: POG2041J01C
```

You can verify if any QSFP or CFP has been removed from the NCS 1002.

Step 2 **admin**

Enters System Admin EXEC mode.

Example:

```
RP/0/RP0/CPU0:ios# admin
```

Step 3 **show inventory**

Displays inventory information for all the physical entities of the NCS 1002.

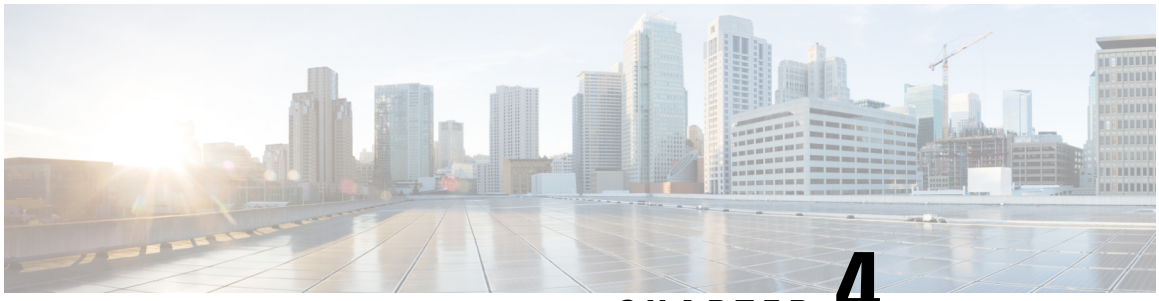
Example:

```
sysadmin-vm:0_RP0# show inventory
Wed Feb 28 03:33:20.186 UTC

 Name: Rack 0               Descr: Network Convergence System 1002 20 QSFP28/QSFP+ slots
 PID: NCS1002-K9            VID: V01                  SN: CAT2028B013

 Name: 0/0                  Descr: Network Convergence System 1002 20 QSFP28/QSFP+ slots
 PID: NCS1002-K9            VID: V01                  SN: CAT2028B013

 Name: 0/RP0                Descr: Network Convergence System 1000 Controller
 PID: NCS1K-CNTLR           VID: V03                  SN: CAT2043B2HJ

 Name: 0/FT0                Descr: Network Convergence System 1000 Fan
```

```
 PID: NCS1K-FTA              VID: V01                   SN: N/A

 Name: 0/FT1                 Descr: Network Convergence System 1000 Fan
 PID: NCS1K-FTA              VID: V01                   SN: N/A

 Name: 0/FT2                 Descr: Network Convergence System 1000 Fan
PID: NCS1K-FTA              VID: V01                   SN: N/A

 Name: 0/PM0                 Descr: Network Convergence System 1000 2KW AC PSU
 PID: NCS1K-2KW-AC           VID: V01                   SN: POG2037J05N

 Name: 0/PM1                 Descr: Network Convergence System 1000 2KW AC PSU
 PID: NCS1K-2KW-AC           VID: V01                   SN: POG2041J00A
```

In the above output, the significant fields are:

- PID—Physical model name of the chassis or node.
- VID—Physical hardware revision of the chassis or node.
- SN—Physical serial number for the chassis or node.



CHAPTER 4

Create User Profiles and Assign Privileges

To provide controlled access to the System Admin configurations on the NCS 1002, user profiles are created with assigned privileges. The privileges are specified using command rules and data rules. The authentication, authorization, and accounting (`aaa`) commands are used in the System Admin Config mode for the creation of users, groups, command rules, and data rules. The `aaa` commands are also used for changing the disaster-recovery password.

Users are authenticated using username and password. Authenticated users are entitled to execute commands and access data elements based on the command rules and data rules that are created and applied to user groups. All users, who are part of a user group, have such access privileges to the system as defined in the command rules and data rules for that user group.

Use the **show run aaa** command in the System Admin Config mode to view existing aaa configurations.

The topics covered in this chapter are:

Create a User Profile

Create new users for the System Admin. Users are included in a user group and assigned certain privileges. The users have restricted access to the commands and configurations in the System Admin console, based on assigned privileges.

The NCS 1002 supports a maximum of 1024 user profiles.

Note Users created in the System Admin are different from the ones created in XR. As a result, the username and password of a System Admin user cannot be used to access the XR, and vice versa.

Note When the user profile is initially created in IOS XR, the user name and password are synchronized with the System Admin if the user does not exist in System Admin. However, when the password is subsequently changed or when the user is removed in XR, the changes are not synchronized with the System Admin. Hence, the user must be created again on the System Admin.

The XR user can access the System Admin by entering **admin** command in the XR EXEC mode. The NCS 1002 does not prompt you to enter any username and password. The XR user is provided full access to the System Admin console.

Procedure

Step 1 **admin**

Example:

```
RP/0/RP0/CPU0:ios# admin
```

Enters System Admin EXEC mode.

Step 2 **configure**

Example:

```
sysadmin-vm:0_RP0# configure
```

Enters System Admin Config mode.

Step 3 **aaa authentication users user** *user_name*

Example:

```
sysadmin-vm:0_RP0#(config)#aaa authentication users user us1
```

Creates a new user and enters user configuration mode. In the example, the user "us1" is created.

Step 4 **password** *password*

Example:

```
sysadmin-vm:0_RP0#(config-user-us1)#password pwd1
```

Enter the password that will be used for user authentication at the time of login into System Admin.

Step 5 **uid** *user_id_value*

Example:

```
sysadmin-vm:0_RP0#(config-user-us1)#uid 100
```

Specify a numeric value. You can enter any 32 bit integer.

Step 6 **gid** *group_id_value*

Example:

```
sysadmin-vm:0_RP0#(config-user-us1)#gid 50
```

Specify a numeric value. You can enter any 32 bit integer.

Step 7 **ssh_keydir** *ssh_keydir*

Example:

```
sysadmin-vm:0_RP0#(config-user-us1)#ssh_keydir dir1
```

Specify any alphanumeric value.

Step 8 **homedir** *homedir*

Example:

```
sysadmin-vm:0_RP0#(config-user-us1)#homedir dir2
```

Specify any alphanumeric value.

Step 9 Use the **commit** or **end** command.

commit-Saves the configuration changes and remains within the configuration session.

end-Prompts user to take one of these actions:

- **Yes**-Saves configuration changes and exits the configuration session.
- **No**-Exits the configuration session without committing the configuration changes.
- **Cancel**-Remains in the configuration session, without committing the configuration changes.

What to do next

- Create user group that includes the user created in this task. See Create a User Group, on page 41.
- Create command rules that apply to the user group. See Create Command Rules, on page 43.
- Create data rules that apply to the user group. See Create Data Rules, on page 45.

Create a User Group

Create a new user group to associate command rules and data rules with it. The command rules and data rules are enforced on all users that are part of the user group.

The NCS 1002 supports a maximum of 32 user groups.

Before you begin

Create a user profile. See Create a User Profile, on page 39.

Procedure

Step 1 **admin**

Example:

```
RP/0/RP0/CPU0:ios# admin
```

Enters System Admin EXEC mode.

Step 2 **configure**

Example:

```
sysadmin-vm:0_RP0# configure
```

Enters System Admin Config mode.

Step 3 **aaa authentication groups group** *group_name*

Example:

```
sysadmin-vm:0_RP0#(config)#aaa authentication groups group gr1
```

Creates a new user group (if it is not already present) and enters the group configuration mode. In this example, the user group "gr1" is created.

Note By default, the user group "root-system" is created by the system at the time of root user creation. The root user is part of this user group. Users added to this group get root user permissions.

Step 4 **users** *user_name*

Example:

```
sysadmin-vm:0_RP0#(config-group-gr1)#users us1
```

Specify the name of the user that should be part of the user group.

You can specify multiple user names enclosed withing double quotes. For example, **users** "*user1 user2 ...*".

Step 5 **gid** *group_id_value*

Example:

```
sysadmin-vm:0_RP0#(config-group-gr1)#gid 50
```

Specify a numeric value. You can enter any 32 bit integer.

Step 6 Use the **commit** or **end** command.

commit-Saves the configuration changes and remains within the configuration session.

end-Prompts user to take one of these actions:

- **Yes**-Saves configuration changes and exits the configuration session.
- **No**-Exits the configuration session without committing the configuration changes.
- **Cancel**-Remains in the configuration session, without committing the configuration changes.

What to do next

- Create command rules. See Create Command Rules, on page 43.
- Create data rules. See Create Data Rules, on page 45.

Create Command Rules

Command rules are rules based on which users of a user group are either permitted or denied the use of certain commands. Command rules are associated to a user group and get applied to all users who are part of the user group.

A command rule is created by specifying whether an operation is permitted, or denied, on a command. This table lists possible operation and permission combinations:

Operation	**Accept Permission**	**Reject Permission**
Read (R)	Command is displayed on the CLI when "?" is used.	Command is not displayed on the CLI when "?" is used.
Execute (X)	Command can be executed from the CLI.	Command cannot be executed from the CLI.
Read and execute (RX)	Command is visible on the CLI and can be executed.	Command is neither visible nor executable from the CLI.

By default, all permissions are set to **Reject**.

Each command rule is identified by a number associated with it. When multiple command rules are applied to a user group, the command rule with a lower number takes precedence. For example, cmdrule 5 permits read access, while cmdrule10 rejects read access. When both these command rules are applied to the same user group, user in this group gets read access because cmdrule 5 takes precedence.

As an example, the command rule is created to deny read and execute permissions for the "show platform" command.

Before you begin

Create an user group. See Create a User Group, on page 41.

Procedure

Step 1 **admin**

Example:

```
RP/0/RP0/CPU0:ios# admin
```

Enters System Admin EXEC mode.

Step 2 **configure**

Example:

```
sysadmin-vm:0_RP0# configure
```

Enters System Admin Config mode.

Step 3 **aaa authorization cmdrules cmdrule** *command_rule_number*

Example:

```
sysadmin-vm:0_RP0#(config)#aaa authorization cmdrules cmdrule 1100
```

Specify a numeric value as the command rule number. You can enter a 32 bit integer.

Important Do no use numbers between 1 to 1000 because they are reserved by Cisco.

This command creates a new command rule (if it is not already present) and enters the command rule configuration mode. In the example, command rule "1100" is created.

Note By default "cmdrule 1" is created by the system when the root-system user is created. This command rule provides "accept" permission to "read" and "execute" operations for all commands. Therefore, the root user has no restrictions imposed on it, unless "cmdrule 1" is modified.

Step 4 **command** *command_name*

Example:

```
sysadmin-vm:0_RP0#(config-cmdrule-1100)#command "show platform"
```

Specify the command for which permission is to be controlled.

If you enter an asterisk '*' for **command**, it indicates that the command rule is applicable to all commands.

Step 5 **ops {r | x | rx}**

Example:

```
sysadmin-vm:0_RP0#(config-cmdrule-1100)#ops rx
```

Specify the operation for which permission has to be specified:

- **r** — Read
- **x** — Execute
- **rx** — Read and execute

Step 6 **action** {**accept** | **accept_log** | **reject**}

Example:

```
sysadmin-vm:0_RP0#(config-cmdrule-1100)#action reject
```

Specify whether users are permitted or denied the use of the operation.

- **accept** — users are permitted to perform the operation
- **accept_log**— users are permitted to perform the operation and every access attempt is logged.
- **reject**— users are restricted from performing the operation.

Step 7 **group** *user_group_name*

Example:

```
sysadmin-vm:0_RP0#(config-cmdrule-1100)#group gr1
```

Specify the user group on which the command rule is applied.

Step 8 **context** *connection_type*

Example:

```
sysadmin-vm:0_RP0#(config-cmdrule-1100)#context *
```

Specify the type of connection to which this rule applies. The connection type can be *netconf* (Network Configuration Protocol), *cli* (Command Line Interface), or *xml* (Extensible Markup Language). It is

recommended that you enter an asterisk '*'; this indicates that the command rule applies to all connection types.

Step 9 Use the **commit** or **end** command.

commit-Saves the configuration changes and remains within the configuration session.

end-Prompts user to take one of these actions:

- **Yes**-Saves configuration changes and exits the configuration session.
- **No**-Exits the configuration session without committing the configuration changes.
- **Cancel**-Remains in the configuration session, without committing the configuration changes.

What to do next

Create data rules. See Create Data Rules, on page 45.

Create Data Rules

Data rules are rules based on which users of the user group are either permitted, or denied, accessing and modifying configuration data elements. The data rules are associated to a user group. The data rules get applied to all users who are part of the user group.

Each data rule is identified by a number associated to it. When multiple data rules are applied to a user group, the data rule with a lower number takes precedence.

Before you begin

Create an user group. See Create a User Group, on page 41.

Procedure

Step 1 **admin**

Example:

```
RP/0/RP0/CPU0:ios# admin
```

Enters System Admin EXEC mode.

Step 2 **configure**

Example:

```
sysadmin-vm:0_RP0# configure
```

Enters System Admin Config mode.

Step 3 **aaa authorization datarules datarule** *data_rule_number*

Example:

```
sysadmin-vm:0_RP0#(config)#aaa authorization datarules datarule 1100
```

Specify a numeric value as the data rule number. You can enter a 32 bit integer.

Important Do no use numbers between 1 to 1000 because they are reserved by Cisco.

This command creates a new data rule (if it is not already present) and enters the data rule configuration mode. In the example, data rule "1100" is created.

Note By default "datarule 1" is created by the system when the root-system user is created. This data rule provides "accept" permission to "read", "write", and "execute" operations for all configuration data. Therefore, the root user has no restrictions imposed on it, unless "datarule 1" is modified.

Step 4 **keypath** *keypath*

Example:

```
sysadmin-vm:0_RP0#(config-datarule-1100)#keypath  /aaa/disaster-recovery
```

Specify the keypath of the data element. The keypath is an expression defining the location of the data element. If you enter an asterisk '*****' for **keypath** , it indicates that the command rule is applicable to all configuration data.

Step 5 **ops** *operation*

Example:

```
sysadmin-vm:0_RP0#(config-datarule-1100)#ops rw
```

Specify the operation for which permission has to be specified. Various operations are identified by these letters:

- c—Create
- d—Delete
- u—Update
- w— Write (a combination of create, update, and delete)
- r—Read
- x—Execute

Step 6 **action** {**accept** | **accept_log** | **reject**}

Example:

```
sysadmin-vm:0_RP0#(config-datarule-1100)#action reject
```

Specify whether users are permitted or denied the operation.

- **accept** — users are permitted to perform the operation
- **accept_log**— users are permitted to perform the operation and every access attempt is logged
- **reject**— users are restricted from performing the operation

Step 7 **group** *user_group_name*

Example:

```
sysadmin-vm:0_RP0#(config-datarule-1100)#group gr1
```

Specify the user group on which the data rule is applied. Multiple group names can also be specified.

Step 8 **context** *connection type*

Example:

```
sysadmin-vm:0_RP0#(config-datarule-1100)#context *
```

Specify the type of connection to which this rule applies. The connection type can be *netconf* (Network Configuration Protocol), *cli* (Command Line Interface), or *xml* (Extensible Markup Language). It is recommended that you enter an asterisk '*', which indicates that the command applies to all connection types.

Step 9 **namespace** *namespace*

Example:

```
sysadmin-vm:0_RP0#(config-datarule-1100)#namespace *
```

Enter asterisk '*' to indicate that the data rule is applicable for all namespace values.

Step 10 Use the **commit** or **end** command.

commit-Saves the configuration changes and remains within the configuration session.

end-Prompts user to take one of these actions:

- **Yes**-Saves configuration changes and exits the configuration session.
- **No**-Exits the configuration session without committing the configuration changes.
- **Cancel**-Remains in the configuration session, without committing the configuration changes.

Change Disaster-recovery Username and Password

When you define the root-system username and password initially after starting the NCS 1002, the same username and password gets mapped as the disaster-recovery username and password for the System Admin mode. However, it can be changed.

The disaster-recovery username and password are useful in these scenarios:

- Access the system when the AAA database, which is the default source for authentication in System Admin, is corrupted.
- Access the system through the management port, when, for some reason, the System Admin console is not working.
- Create new users by accessing the System Admin using the disaster-recovery username and password, when the regular username and password is forgotten.

Note You can configure only one disaster-recovery username and password at a time.

Before you begin

Complete the user creation. For details, see Create a User Profile, on page 39.

Procedure

Step 1 **admin**

Example:

```
RP/0/RP0/CPU0:ios# admin
```

Enters System Admin EXEC mode.

Step 2 **configure**

Example:

```
sysadmin-vm:0_RP0# configure
```

Enters System Admin Config mode.

Step 3 **aaa disaster-recovery username** *username* **password** *password*

Example:

```
sysadmin-vm:0_RP0#(config)#aaa disaster-recovery username us1 password pwd1
```

Specify the disaster-recovery username and the password. You have to select an existing user as the disaster-recovery user. In the example, 'us1' is selected as the disaster-recovery user and assigned the password as 'pwd1'. The password can be entered as a plain text or md5 digest string.

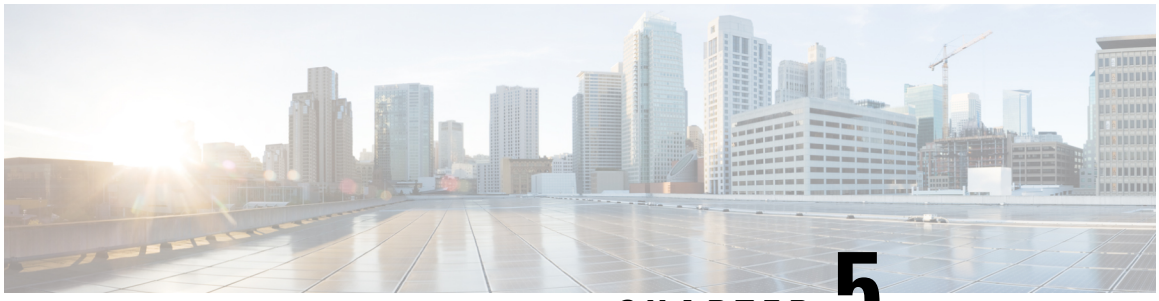
When you need to make use of the disaster recovery username, you need to enter it as *username***@localhost**.

Step 4 Use the **commit** or **end** command.

commit-Saves the configuration changes and remains within the configuration session.

end-Prompts user to take one of these actions:

- **Yes**-Saves configuration changes and exits the configuration session.
- **No**-Exits the configuration session without committing the configuration changes.
- **Cancel**-Remains in the configuration session, without committing the configuration changes.



CHAPTER 5

Perform System Upgrade and Install Feature Packages

The system upgrade and package installation processes are executed using **install** commands on the NCS 1002. The processes involve adding and activating the iso images (*.iso*), feature packages (*.rpm*), and software maintenance upgrade files (*.smu*) on the NCS 1002. These files are accessed from a network server and then activated on the NCS 1002. If the installed package or SMU causes any issue, it can be uninstalled.

Note It is recommended that you collect the output of **show tech-support ncs1k** command before performing operations such as reload or CPU OIR on the NCS 1002 system. The command provides information about the state of the system before reload or before the CPU-OIR operation is performed and is useful in debugging.

Note The Bridge SMUs for R6.1.2, R6.2.2, and R6.3.1 are available here. The relevant Bridge SMU for the source release must be installed before upgrading to R6.3.x, R6.5.x, and R7.x.x. For example, the Bridge SMU for R6.1.2 must be installed before upgrading R6.1.2 to R6.3.2.

Note From R6.5.2, python 2.7 standard library package (python27.tar.gz) is available as an optional package on CCO. This package is required to implement python automation scripts. This package can be downloaded using ZTP (ztp -i command).

Note The output of the examples in the procedures is not from the latest software release. The output will change for any explicit references to the current release.

The topics covered in this chapter are:

Upgrade the System

Upgrading the system is the process of installing a new version of the Cisco IOS XR operating system on the NCS 1002. The NCS 1002 comes pre-installed with the Cisco IOS XR image. However, you can install the new version in order to keep features up to date. The system upgrade operation is performed from the XR mode. However, during system upgrade, the operating systems that run both on the XR and the System Admin get upgraded.

System upgrade is done by installing a base package–Cisco IOS XR Core Bundle plus Manageability Package. The file name for this bundle is *ncs1k-xr-7.2.1*. Install this ISO image using the **install** commands. For more information about the install process, see Workflow for Install Process, on page 51.

Note Software upgrade from a release having 2 bit Association Number (AN) support (R6.1.2 or below) to a release having 4 bit AN support (R6.2.1 or above) is not supported. When software is upgraded, the slice must be re-provisioned using the **upgrade hw-module slice all** command after the upgrade. The traffic is affected until the re-provisioning completes.

For more information on upgrading the system and the RPMs, see *Cisco IOS XR Flexible Packaging Configuration Guide for Cisco NCS 1000 Series*.

Note Software Maintenance Upgrades (SMUs) must be installed if you observe a critical alarm when the software is upgraded from Release 6.3.1 to Release 6.3.2 or 6.5.1.

For more information, see the field notice.

Software Upgrade Matrix

The following table lists the upgrade paths supported for Cisco NCS 1002.

Source Release	Destination Release	Bridge SMUs
R6.1.2	R6.3.2, R6.5.1, R6.5.2	ncs1k-6.1.2.CSCvf01652, ncs1k-sysadmin-6.1.2.CSCvf01652
R6.2.2	R6.3.2, R6.5.1, R6.5.2	ncs1k-6.2.2.CSCvf01652, ncs1k-sysadmin-6.2.2.CSCvf01652
R6.3.1	R6.3.2, R6.5.1, R6.5.2, R7.0.1, R7.1.1, and R7.2.1	• ncs1k-6.3.1.CSCvf01652 • ncs1k-sysadmin-6.3.1.CSCvf01652
R6.3.2	R6.5.1, R6.5.2, R7.0.1, R7.1.1, and R7.2.1	None
R6.5.1	R6.5.2, R7.0.1, R7.1.1, and R7.2.1	None

Source Release	Destination Release	Bridge SMUs
R6.5.2	R7.0.1, R7.1.1, and R7.2.1	None
R7.0.1	R7.1.1 and R7.2.1	None
R7.1.1	R7.2.1 and R7.3.2	None
R7.2.1	R7.3.2	None
R7.3.1	R7.3.2	None

Install Packages

Packages and software patches (SMU) can be installed on NCS 1002. Installing a package on NCS 1002 installs specific features that are part of that package. Cisco IOS XR software is divided into various software packages; this enables you to select the features to run on NCS 1002. Each package contains components that perform a specific set of NCS 1002 functions.

The naming convention of the package is `<platform>-<pkg>-<pkg version>-<release version>.<architecture>.rpm`. Standard packages are:

Feature Set	Filename	Description
Composite Package		
Cisco IOS XR Core Bundle + Manageability Package	ncs1k-iosxr-px-k9-7.3.2.tar	Contains required core packages, including OS, Admin, Base, Forwarding, SNMP Agent, FPD, and Alarm Correlation and Netconf-yang, Telemetry, Extensible Markup Language (XML) Parser, HTTP server packages.
Individually-Installable Optional Packages		
Cisco IOS XR Security Package	ncs1k-k9sec-4.1.0.0-r732.x86_64.rpm	Support for Encryption, Decryption, IP Security (IPSec), Secure Socket Layer (SSL), and Public-key infrastructure (PKI).

Workflow for Install Process

To install a package, see Install Packages, on page 52. To uninstall a package, see Uninstall Packages, on page 58. The workflow for installation and uninstallation processes are depicted in individual flowcharts in their respective subsections.

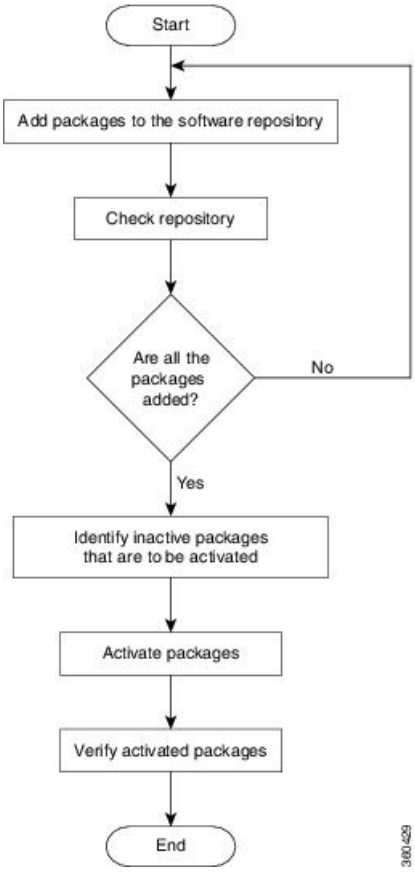
Install Packages

Complete this task to upgrade the system or install a patch. The system upgrade is done using an ISO image file, while the patch installation is done using packages and SMUs. This task is also used to install *.tar* files. The *.tar* file contains multiple packages and SMUs that are merged into a single file. A single *.tar* file can contain up to 64 individual files. The packaging format defines one RPM per component, without dependency on the card type.

Note To install a System Admin package or a XR package, execute the **install** commands in System Admin EXEC mode or XR EXEC mode respectively. All **install** commands are applicable in both these modes.

The workflow for installing a package is shown in this flowchart.

Figure 1: Installing Packages Workflow



Note Disable auto-fpd upgrade before the software upgrade.

```
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
```

Before you begin

- Configure and connect to the management port. The installable file is accessed through the management port. For details about configuring the management port, see Configure Management Interface, on page 13
- Copy the package to be installed either on the NCS 1002 hard disk or on a network server to which the NCS 1002 has access.
- When ncs1k-k9sec package is not installed, use only FTP or TFTP to copy files or during the **install add** operation.

Procedure

Step 1 Execute one of these commands:

- **install add source** *<tftp transfer protocol>/package_path/ filename1 filename2 ...*
- **install add source** *<ftp or sftp transfer protocol>//user@server:/package_path/ filename1 filename2 ...*

Example:

```
RP/0/RP0/CPU0:ios#install add source harddisk: ncs1k-mini-x-7.0.1.iso
ncs1k-k9sec-4.1.0.0-r701.x86_64.rpm


Fri Jul 19 16:02:02.071 IST
Jul 19 16:02:04 Install operation 1 started by root:
 install add source harddisk: ncs1k-mini-x-7.0.1.iso ncs1k-k9sec-4.1.0.0-r701.x86_64.rpm
Jul 19 16:02:05 Install operation will continue in the background
RP/0/RP0/CPU0:ios#Jul 19 16:03:35 Install operation 1 finished successfully
```

The software files are unpacked from the package and added to the software repository. This operation may take time depending on the size of the files being added. The operation is performed in asynchronous mode. The **install add** command runs in the background, and the EXEC prompt is returned.

Note install operation over IPv6 is not supported.

Step 2 **show install request**

Example:

```
RP/0/RP0/CPU0:ios#show install request


Fri Jul 19 16:09:47.908 IST
The install add operation 4 is 60% complete
```

(Optional) Displays the operation ID of the add operation and its status. The operation ID can be used later to execute the **activate** command.

Step 3 **show install repository**

Example:

```
RP/0/RP0/CPU0:ios#show install repository
```

```
Fri Jul 19 16:11:53.189 IST
4 package(s) in XR repository:
    ncs1k-mini-x-7.0.1
    ncs1k-k9sec-4.1.0.0-r652.x86_64
    ncs1k-xr-6.5.2
    ncs1k-k9sec-4.1.0.0-r701.x86_64
```

Displays packages that are added to the repository. Packages are displayed only after the `install add` operation is complete.

Step 4 **show install inactive**

Example:

```
RP/0/RP0/CPU0:ios#show install inactive
```

Displays inactive packages that are present in the repository. Only inactive packages can be activated.

Step 5 Execute one of these commands:

- **install activate** *package_name*
- **install activate id** *operation_id*

Example:

```
RP/0/RP0/CPU0:ios#install activate id 4


Fri Jul 19 16:16:20.091 IST
Jul 19 16:16:22 Install operation 6 started by root:
  install activate id 4
Jul 19 16:16:22 Package list:
Jul 19 16:16:22     ncs1k-mini-x-7.0.1
Jul 19 16:16:22     ncs1k-k9sec-4.1.0.0-r652.x86_64
Jul 19 16:16:22     ncs1k-xr-6.5.2
Jul 19 16:16:22     ncs1k-k9sec-4.1.0.0-r701.x86_64
This install operation will reload the system, continue?
 [yes/no]:[yes] yes
Jul 19 16:17:17 Install operation will continue in the background
```

The package configurations are made active on the NCS 1002. As a result, new features and software fixes take effect. This operation is performed in asynchronous mode. The **install activate** command runs in the background, and the EXEC prompt is returned.

Note After an RPM of a higher version is activated, and if it is required to activate an RPM of a lower version, use the force option. For example:

Using the traditional method, add the RPM with lower version to the repository and then force the activation:

```
install add source repository ncs1k-mini-x-7.0.1
```

```
install activate ncs1k-mini-x-7.0.1 force
```

or

Using the install update command:

```
install update source repository ncs1k-mini-x-7.0.1
```

If you use the operation ID, all packages that were added in the specified operation are activated together. For example, if 5 packages are added in operation 8, by executing the **install activate id 8** command, all 5 packages are activated together. You do not have to activate the packages individually.

Step 6 **show install active**

Example:

```
RP/0/RP0/CPU0:ios#show install active
```

Displays packages that are active.

Step 7 **install commit system**

Example:

```
RP/0/RP0/CPU0:ios#install commit system


Fri Jul 19 18:03:12.845 IST
Jul 19 18:03:16 Install operation 7 started by root:
  install commit
Jul 19 18:03:17 Install operation will continue in the background
RP/0/RP0/CPU0:ios#Jul 19 18:04:01 Install operation 7 finished successfully
```

Commits the newly active software.

Note If you perform a manual or automatic system reload without completing the transaction with the install commit command during system update, 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. This action clears all configuration rollback points available. You will not be able to rollback to, or view, any commits made until the install rollback event. Any new commits made after the install rollback event will start from commit ID '1000000001'.

Installing Packages: Related Commands

Related Commands	Purpose
show install log	Displays the log information for the install process; this can be used for troubleshooting in case of installation failure.
show install package	Displays the details of the packages that have been added to the repository. Use this command to identify individual components of a package.
install prepare	Makes pre-activation checks on an inactive package, to prepare it for activation.
show install prepare	Displays the list of package that have been prepared and are ready for activation.

What to do next

- After performing a system upgrade, upgrade FPD by using the **upgrade hw-module location all fpd all** command from the Cisco IOS XR mode. The progress of FPD upgrade process can be monitored using the **show hw-module fpd** command.
- Reload NCS 1002 if any FPD status is in RLOAD REQ state. If CTRL FPGA is in RLOAD REQ state, use the **hw-module location all reload** command. If Daisy Duke or BIOS is in RLOAD REQ state, use the **hw-module location 0/RP0 reload** command.

- Verify the installation using the **install verify packages** command.
- Uninstall the packages or SMUs if their installation causes any issues on the NCS 1002. See Uninstall Packages, on page 58.

Note ISO images cannot be uninstalled. However, you can perform a system downgrade by installing an older ISO version.

(Optional) Install Prepared Packages

A system upgrade or feature upgrade is performed by activating the ISO image file, packages, and SMUs. It is possible to prepare these installable files before activation. During the prepare phase, pre-activation checks are made and the components of the installable files are loaded on to the NCS 1002 setup. The prepare process runs in the background and the NCS 1002 is fully usable during this time. When the prepare phase is over, the prepared files can be activated instantaneously. The advantages of preparing before activation are:

- If the installable file is corrupted, the prepare process fails. This provides an early warning of the problem. If the corrupted file was activated directly, it may cause the NCS 1002 to malfunction.
- Directly activating an ISO image for system upgrade takes considerable time during which the NCS 1002 is not usable. However, if the image is prepared before activation, not only does the prepare process run asynchronously, but when the prepared image is subsequently activated, the activation process too takes less time. As a result, the downtime is considerably reduced.

Complete this task to upgrade the system and install packages by making use of the prepare operation.

Procedure

Step 1 Add the required ISO image and packages to the repository.

For details, see Install Packages, on page 52.

Step 2 **show install repository**

Perform this step to verify that the required installable files are available in the repository. Packages are displayed only after the "install add" operation is complete.

Step 3 Execute one of these commands:

- **install prepare** *package_name*
- **install prepare id** *operation_id*

Example:

```
RP/0/RP0/CPU0:ios#install prepare ncs1k-k9sec-4.1.0.0-r701.x86_64
```

or

```
RP/0/RP0/CPU0:ios#install prepare id 21
```

The prepare process takes place. This operation is performed in asynchronous mode. The **install prepare** command runs in the background, and the EXEC prompt is returned.

If you use the operation ID, all packages that were added in the specified operation are prepared together. For example, if 5 packages are added in operation 22, by executing the **install prepare id 21** command, all 5 packages are prepared together. You do not have to prepare the packages individually.

Step 4 **show install prepare**

Example:

```
RP/0/RP0/CPU0:ios#show install prepare
```

Displays packages that are prepared. From the result, verify that all required packages have been prepared.

Step 5 **install activate** *package_name*

All packages that have been prepared are activated together to activate the package configurations on the NCS 1002.

Activation of some SMUs require manual reload of the NCS 1002. When such SMUs are activated, a warning message is displayed to perform reload. The components of the SMU get activated only after the reload is complete. Perform the NCS 1002 reload immediately after the execution of the **install activate** command is completed.

Step 6 **show install active**

Example:

```
RP/0/RP0/CPU0:ios#show install active
```

Displays packages that are active.

Step 7 **install commit system**

Example:

```
RP/0/RP0/CPU0:ios#install commit system


Fri Jul 19 18:03:12.845 IST
Jul 19 18:03:16 Install operation 7 started by root:
  install commit
Jul 19 18:03:17 Install operation will continue in the background
RP/0/RP0/CPU0:ios#Jul 19 18:04:01 Install operation 7 finished successfully
```

Commits the recently activated software.

Installing Packages: Related Commands

Related Commands	Purpose
show install log	Displays the log information for the install process; this can be used for troubleshooting in case of install failure.
show install package	Displays the details of the packages that have been added to the repository. Use this command to identify individual components of a package.
install prepare clean	Clears the prepare operation and removes the packages from the prepared state.

What to do next

- After performing a system upgrade, upgrade FPD by using the **upgrade hw-module location all fpd all** command from the Cisco IOS XR mode. The progress of FPD upgrade process can be monitored using the **show hw-module fpd** command.
- Reload NCS 1002 if any FPD status is in RLOAD REQ state. If CTRL FPGA is in RLOAD REQ state, use the **hw-module location all reload** command. If Daisy Duke or BIOS is in RLOAD REQ state, use the **hw-module location 0/RP0 reload** command.
- Verify the installation using the **install verify packages** command.
- Uninstall the packages or SMUs if their installation causes any issues on the NCS 1002. See Uninstall Packages, on page 58.

Note ISO images cannot be uninstalled. However, you can perform a system downgrade by installing an older ISO version.

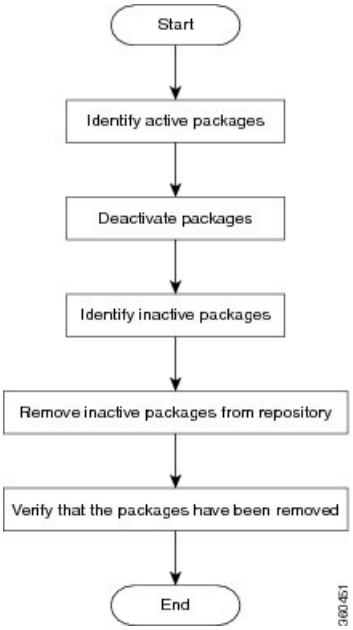
Uninstall Packages

Complete this task to uninstall a package. All the NCS 1002 functionalities that are part of the uninstalled package are deactivated. Packages that are added in the XR mode cannot be uninstalled from the System Admin mode, and vice versa.

Note Installed ISO images cannot be uninstalled. Also, kernel SMUs that install third party SMU on host, XR mode and System Admin mode, cannot be uninstalled. However, subsequent installation of ISO image or kernel SMU overwrites the existing installation.

The workflow for uninstalling a package is shown in this flowchart.

Figure 2: Uninstalling Packages Workflow



Procedure

Step 1 **show install active**

Displays active packages. Only active packages can be deactivated.

Step 2 Execute one of these commands:

- **install deactivate** *package_name*
- **install deactivate id** *operation_id*

Example:

```
RP/0/RP0/CPU0:ios#install deactivate ncs1k-k9sec-4.1.0.0-r701.x86_64
```

or

```
RP/0/RP0/CPU0:ios#install deactivate id 8
```

All features and software patches associated with the package are deactivated. You can specify multiple package names and deactivate them simultaneously.

If you use the operation ID, all packages that were added in the specified operation are deactivated together. You do not have to deactivate the packages individually.

Step 3 **show install inactive**

The deactivated packages are now listed as inactive packages. Only inactive packages can be removed from the repository.

Step 4 **install remove** *package_name*

Example:

```
RP/0/RP0/CPU0:ios#install remove ncs1k-k9sec-4.1.0.0-r701.x86_64
```

The inactive packages are removed from the repository.

Use the **install remove** command with the **id** *operation-id* keyword and argument to remove all packages that were added for the specified operation ID.

Step 5 **show install repository**

Displays packages available in the repository. The package that are removed are no longer displayed in the result.

What to do next

Install required packages. See Install Packages, on page 52

Upgrading the Firmware

Use the following procedure to upgrade the firmware.

Procedure

Step 1 Use the **show hw-module fpd** command to display information about the current FPD image. You can use this command to determine if you must upgrade the FPD image version.

No FPD image version upgrade is required if the status is CURRENT in the command output.

Example:

```
RP/0/RP0/CPU0:ios#show hw-module fpd
Fri Aug 30 07:30:01.111 UTC
                                                                FPD Versions
                                                                ================
Location   Card type             HWver FPD device       ATR Status   Running Programd
--------------------------------------------------------------------------------
0/0        NCS1002-K9            1.2   CDSP_PORT_05         CURRENT    3.77    3.77
0/0        NCS1002-K9            1.2   CDSP_PORT_06         CURRENT    3.77    3.77
0/0        NCS1002-K9            1.2   CDSP_PORT_12         CURRENT    3.77    3.77
0/0        NCS1002-K9            1.2   CDSP_PORT_13         CURRENT    3.77    3.77
0/0        NCS1002-K9            1.2   CDSP_PORT_19         CURRENT    3.77    3.77
0/0        NCS1002-K9            1.2   CDSP_PORT_20         CURRENT    3.77    3.77
0/0        NCS1002-K9            1.2   CDSP_PORT_26         CURRENT    3.77    3.77
0/0        NCS1002-K9            1.2   CDSP_PORT_27         CURRENT    3.77    3.77
0/0        NCS1002-K9            2.1   CFP2_PORT_05         CURRENT    5.52    5.52
0/0        NCS1002-K9            2.1   CFP2_PORT_06         CURRENT    5.52    5.52
0/0        NCS1002-K9            2.1   CFP2_PORT_12         CURRENT    5.52    5.52
0/0        NCS1002-K9            2.1   CFP2_PORT_13         CURRENT    5.52    5.52
0/0        NCS1002-K9            5.0   CFP2_PORT_19         CURRENT    3.26    3.26
0/0        NCS1002-K9            2.1   CFP2_PORT_20         CURRENT    5.52    5.52
0/0        NCS1002-K9            2.1   CFP2_PORT_26         CURRENT    5.52    5.52
0/0        NCS1002-K9            2.1   CFP2_PORT_27         CURRENT    5.52    5.52
0/0        NCS1002-K9            0.1   CTRL_BKP_LOW      B  CURRENT            2.23
0/0        NCS1002-K9            0.1   CTRL_BKP_UP       B  CURRENT            2.23
0/0        NCS1002-K9            0.1   CTRL_FPGA_LOW        CURRENT    2.23    2.23
0/0        NCS1002-K9            0.1   CTRL_FPGA_UP         CURRENT    2.23    2.23
0/RP0      NCS1K-CNTLR           0.1   BIOS_Backup       BS NEED UPGD          14.00
0/RP0      NCS1K-CNTLR           0.1   BIOS_Primary       S NEED UPGD 14.40    14.40
0/RP0      NCS1K-CNTLR           0.1   Daisy_Duke_BKP    BS NEED UPGD           0.15
```

```
0/RP0      NCS1K-CNTLR           0.1   Daisy_Duke_FPGA   S  NEED UPGD  0.17    0.17
0/PM0      NCS1K-2KW-AC          0.0   PO-PriMCU            NOT READY
0/PM1      NCS1K-2KW-AC          0.0   PO-PriMCU            CURRENT
```

In the above example, the status is NEED UPGD. This status confirms that an FPD image version upgrade is required.

Step 2 Use the **upgrade hw-module location all fpd all** command to upgrade the FPD image.

Step 3 Check whether all the FPDs are upgraded.

```
RP/0/RP0/CPU0:ios#show hw-module fpd
Fri Aug 30 09:25:44.644 UTC
                                                          FPD Versions
                                                          ================
Location   Card type             HWver FPD device       ATR Status   Running Programd
-------------------------------------------------------------------------------------
0/0        NCS1002-K9            1.2   CDSP_PORT_05         CURRENT    3.77    3.77
0/0        NCS1002-K9            1.2   CDSP_PORT_06         CURRENT    3.77    3.77
0/0        NCS1002-K9            1.2   CDSP_PORT_12         CURRENT    3.77    3.77
0/0        NCS1002-K9            1.2   CDSP_PORT_13         CURRENT    3.77    3.77
0/0        NCS1002-K9            1.2   CDSP_PORT_19         CURRENT    3.77    3.77
0/0        NCS1002-K9            1.2   CDSP_PORT_20         CURRENT    3.77    3.77
0/0        NCS1002-K9            1.2   CDSP_PORT_26         CURRENT    3.77    3.77
0/0        NCS1002-K9            1.2   CDSP_PORT_27         CURRENT    3.77    3.77
0/0        NCS1002-K9            2.1   CFP2_PORT_05         CURRENT    5.52    5.52
0/0        NCS1002-K9            2.1   CFP2_PORT_06         CURRENT    5.52    5.52
0/0        NCS1002-K9            2.1   CFP2_PORT_12         CURRENT    5.52    5.52
0/0        NCS1002-K9            2.1   CFP2_PORT_13         CURRENT    5.52    5.52
0/0        NCS1002-K9            5.0   CFP2_PORT_19         CURRENT    3.26    3.26
0/0        NCS1002-K9            2.1   CFP2_PORT_20         CURRENT    5.52    5.52
0/0        NCS1002-K9            2.1   CFP2_PORT_26         CURRENT    5.52    5.52
0/0        NCS1002-K9            2.1   CFP2_PORT_27         CURRENT    5.52    5.52
0/0        NCS1002-K9            0.1   CTRL_BKP_LOW      B  CURRENT             2.23
0/0        NCS1002-K9            0.1   CTRL_FPGA_LOW        CURRENT    2.23    2.23
0/0        NCS1002-K9            0.1   CTRL_FPGA_UP         CURRENT    2.23    2.23
0/0        NCS1002-K9            0.1   CTRL_BKP_UP       B  CURRENT             2.23
0/RP0      NCS1K-CNTLR           0.1   BIOS_Backup       BS CURRENT            14.50
0/RP0      NCS1K-CNTLR           0.1   BIOS_Primary       S RLOAD REQ 14.40    14.50
0/RP0      NCS1K-CNTLR           0.1   Daisy_Duke_BKP    BS CURRENT             0.20
0/RP0      NCS1K-CNTLR           0.1   Daisy_Duke_FPGA    S RLOAD REQ  0.17     0.20
0/PM0      NCS1K-2KW-AC          0.0   PO-PriMCU            NOT READY
0/PM1      NCS1K-2KW-AC          0.0   PO-PriMCU            CURRENT
```

Step 4 Do not reload RP. Use the following steps to reload the RP.

```
RP/0/RP0/CPU0:ios#admin
sysadmin-vm:0_RP0#hw-module location 0/RP0 reload
Thu Aug  13 10:53:48.599 UTC+00:00
Reload node ? [no,yes] yes
```

RP will reload. Wait for RP to come up.

Step 5 Once the RP is up, check whether all the FPDs are in current state.

```
RP/0/RP0/CPU0:ios#show hw-module fpd
Wed Aug 12 13:14:43.467 IST
FPD Versions
================
Location Card type HWver FPD device ATR Status Running Programd
-------------------------------------------------------------------------------------
0/0      NCS1002-K9 1.2  CDSP_PORT_05 CURRENT   3.77    3.77
0/0      NCS1002-K9 1.2  CDSP_PORT_06 CURRENT   3.77    3.77
0/0      NCS1002-K9 1.2  CDSP_PORT_12 CURRENT   3.77    3.77
```

```
0/0      NCS1002-K9 1.2  CDSP_PORT_13 CURRENT   3.77   3.77
0/0      NCS1002-K9 1.2  CDSP_PORT_19 CURRENT   3.77   3.77
0/0      NCS1002-K9 1.2  CDSP_PORT_20 CURRENT   3.77   3.77
0/0      NCS1002-K9 1.2  CDSP_PORT_26 CURRENT   3.77   3.77
0/0      NCS1002-K9 1.2  CDSP_PORT_27 CURRENT   3.77   3.77
0/0      NCS1002-K9 2.0  CFP2_PORT_05 CURRENT   4.40   4.40
0/0      NCS1002-K9 2.1  CFP2_PORT_06 CURRENT   5.52   5.52
0/0      NCS1002-K9 2.1  CFP2_PORT_12 CURRENT   5.52   5.52
0/0      NCS1002-K9 0.0  CFP2_PORT_13 CURRENT   1.01   1.01
0/0      NCS1002-K9 2.1  CFP2_PORT_19 CURRENT   5.52   5.52
0/0      NCS1002-K9 2.1  CFP2_PORT_20 CURRENT   5.52   5.52
0/0      NCS1002-K9 4.2  CFP2_PORT_26 CURRENT   3.20   3.20
0/0      NCS1002-K9 2.1  CFP2_PORT_27 CURRENT   5.52   5.52
0/0      NCS1002-K9 0.1  CTRL_BKP_LOW B CURRENT 2.23
0/0      NCS1002-K9 0.1  CTRL_BKP_UP B CURRENT  2.23
0/0      NCS1002-K9 0.1  CTRL_FPGA_LOW CURRENT  2.23   2.23
0/0      NCS1002-K9 0.1 CTRL_FPGA_UP CURRENT    2.23   2.23
0/RP0    NCS1K-CNTLR 0.1 BIOS_Backup BS CURRENT 15.10
0/RP0    NCS1K-CNTLR 0.1 BIOS_Primary S CURRENT 15.10 15.10
0/RP0    NCS1K-CNTLR 0.1 Daisy_Duke_BKP BS CURRENT 0.20
0/RP0    NCS1K-CNTLR 0.1 Daisy_Duke_FPGA S CURRENT 0.20 0.20
0/PM0    NCS1K-2KW-AC 0.0 PO-PriMCU CURRENT     4.00 4.00
0/PM1    NCS1K-2KW-AC 0.0 PO-PriMCU CURRENT
```

Note

- BIOS downgrade is not supported once BIOS FPD is upgraded to 15.10.
- The 15.10 BIOS FPD version does not have issues for software images prior to R7.2.1. If the user needs to downgrade the software image prior to R7.2.1, the BIOS FPDs always show the status as "NEED UPGRADE".