System Setup and Software Installation Guide for Cisco NCS 1020, IOS XR Releases

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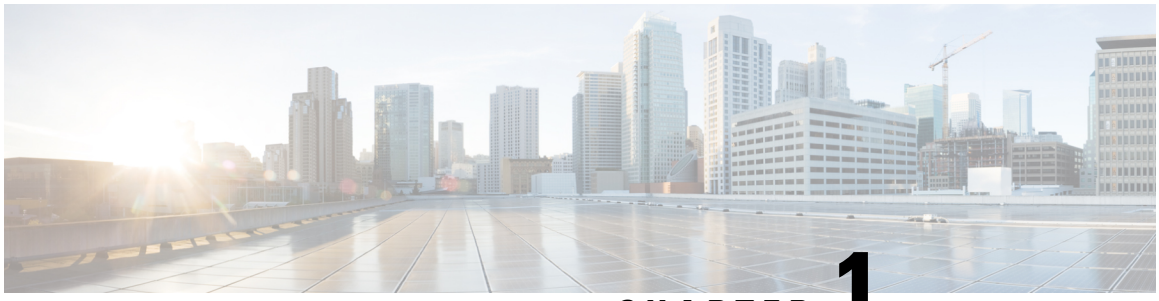


CHAPTER 1

Bring-up Cisco NCS 1020

After installing the hardware, boot the Cisco NCS 1020 system. You can connect to the XR console port and power on the system. NCS 1020 completes the boot process using the pre-installed operating system (OS) image. If no image is available, NCS 1020 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.

There are two options for configuring a password: 'password' and 'secret'.

- Password: Uses type 7 encryption to store the password.
- Secret: Allows for type 5, 8, 9, or 10 hashing algorithms to store the password securely.

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 NCS 1020, on page 1
- Configure Management Interface, on page 21
- Configure Telnet, on page 26
- Configure SSH, on page 26

Boot NCS 1020

Use the console port to connect to NCS 1020. By default, the console port connects to the XR mode. If necessary, you can establish subsequent connections 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, for NCS1010-CTR2-K9, 9600 bps for NCS1010-CTR2-B-K9, 8 data bits, 1 stop bit and no parity.

Step 3 Power on NCS 1020.

To power on the shelves, install the AC or DC power supplies and cables. As NCS 1020 boots up, you can view the boot process details 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 NCS 1020 more time to complete the initial boot procedure; then press **Enter**.

Important
If the boot process fails, it may be because the preinstalled image on the NCS 1020 is corrupt. In this case, you can boot NCS 1020 using an external bootable USB drive.

Boot NCS 1020 Using USB Drive

The bootable USB drive is used to reimage NCS 1020 for system upgrade or to boot the NCS 1020 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.

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

Use this task to boot the NCS 1020 using the USB drive.

Before you begin

- You need a USB drive with a storage capacity of at least 4 GB.
- The USB drive should have a single partition.
- NCS 1020 software image can be downloaded from Software Download page on Cisco.com.

Note Since the NCS 1020 system uses the same XR image as NCS 1010, there are no changes in the USB bootable image name used. Hence the USB bootable image name is the same as NCS 1010.

- Copy the compressed boot file from the software download page at Cisco.com to your local machine. The filename for the compressed boot file is in the format *ncs1010-usb-boot-<release_number>.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
You must extract the contents of the zipped file ("EFI" and "boot" directories) 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.

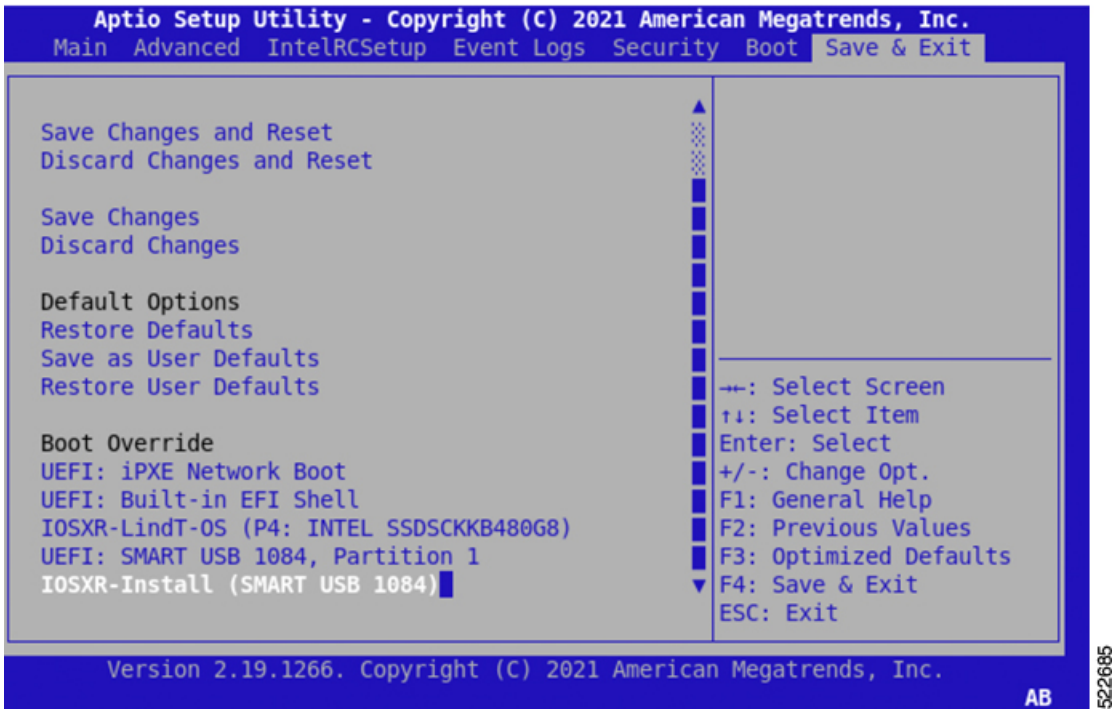
Step 5 Insert the USB drive in one of the USB ports of NCS 1020 line card/controller card.

Step 6 Reboot NCS 1020 using power cycle or console.

Note
Use the **reload bootmedia usb noprompt** command to boot the NCS 1020 from the USB. If you are using the **reload bootmedia usb noprompt** command, then you can skip the remaining steps.

Step 7 Press **Esc** to enter BIOS.

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



Step 9 Choose **IOS -XR Install**.

The BIOS UI displays the USB drive vendor in the brackets, in this case, SMART USB 1084.

The system detects USB and boots the image from USB.

```
Booting from USB..
Loading Kernel..
Verifying (loop)/boot/bzImage...
(loop)/boot/bzImage verified using attached signature.
Loading initrd..
Verifying (loop)/boot/initrd.img...
```

Step 10 Remove the USB drive after the `Rebooting the system after installation` message is displayed. The NCS 1020 reboots automatically.

Note
The USB must be removed only after the image is loaded successfully.

DHCP Configuration

DHCP configuration is required for both manual configuration and ZTP configuration. Follow the below sections to set up DHCP for booting NCS 1020 using ZTP and iPXE.

Introduction to DHCP Relay

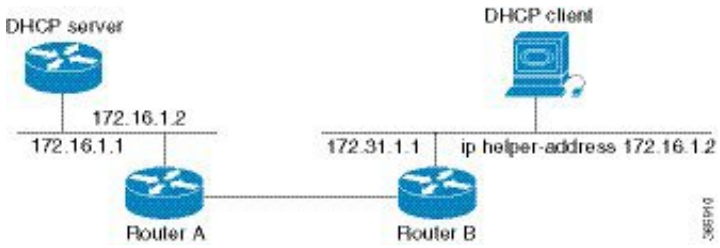
A DHCP relay agent is a host that forwards DHCP packets between clients and servers that do not reside on a shared physical subnet. Relay agent forwarding is distinct from the normal forwarding of an IP router where IP datagrams are switched between networks transparently.

DHCP clients use User Datagram Protocol (UDP) broadcasts to send DHCPDISCOVER messages when they lack information about the network to which they belong.

If a client is on a network segment that does not include a server, a relay agent is needed on that network segment to ensure that DHCP packets reach the servers on another network segment. UDP broadcast packets are not forwarded, because most routers are not configured to forward broadcast traffic. You can configure a DHCP relay agent to forward DHCP packets to a remote server by configuring a DHCP relay profile and configure one or more helper addresses in it. You can assign the profile to an interface or a VRF.

The figure below demonstrates the process. The DHCP client broadcasts a request for an IP address and additional configuration parameters on its local LAN. Acting as a DHCP relay agent, Router B picks up the broadcast, changes the destination address to the DHCP server's address and sends the message out on another interface. The relay agent inserts the IP address of the interface, on which the DHCP client's packets are received into the gateway address (giaddr) field of the DHCP packet, which enables the DHCP server to determine which subnet should receive the offer and identify the appropriate IP address range. The relay agent unicasts the messages to the server address, in this case 172.16.1.2 (which is specified by the helper address in the relay profile).

Figure 1: Forwarding UDP Broadcasts to a DHCP Server Using a Helper Address



Configuring and Enabling the DHCP Relay Agent

Configuration Example

```
RP/0/RP0/CPU0:ios# configure
RP/0/RP0/CPU0:ios(config)# dhcp ipv4
RP/0/RP0/CPU0:ios(config-dhcpv4)# profile r1 relay
RP/0/RP0/CPU0:ios(config-dhcpv4-relay-profile)#  helper-address vrf default 198.51.100.1
giaddr 198.51.100.3
```

```
RP/0/RP0/CPU0:ios(config-dhcpv4-relay-profile)# !
RP/0/RP0/CPU0:ios(config-dhcpv4-relay-profile)# interface GigabitEthernet0/0/0/2 relay
profile r1
RP/0/RP0/CPU0:ios(config-dhcpv4)# commit
```

Running Configuration

```
RP/0/RP0/CPU0:ios# show running-config dhcp ipv4
Tue Aug 29 07:30:50.677 UTC
dhcp ipv4
 profile r1 relay
  helper-address vrf default 198.51.100.1 giaddr 198.51.100.3
 !
 interface GigabitEthernet0/0/0/2 relay profile r1
!
```

Limitations for DHCP Relay Feature

These are the limitations for implementing DHCP relay feature:

- The multicast addresses are not supported. The **helper-address** command in DHCP relay profile submode supports valid unicast IP address as the helper address.

Note Configuring the **helper-address** command directly (not using profile) under a interface (such as BVI interface) is not supported.

- Only interface-id and remote-id DHCP option code are added by a relay agent while forwarding the packet to a DHCP server.

Note Configuring DHCP option code is not supported in DHCP relay profile submode.

Configuring and Enabling the DHCP Relay Agent

Configuration Example

```
RP/0/RP0/CPU0:ios# configure
RP/0/RP0/CPU0:ios(config)# dhcp ipv4
RP/0/RP0/CPU0:ios(config-dhcpv4)# profile r1 relay
RP/0/RP0/CPU0:ios(config-dhcpv4-relay-profile)#  helper-address vrf default 198.51.100.1
giaddr 198.51.100.3
RP/0/RP0/CPU0:ios(config-dhcpv4-relay-profile)# !
RP/0/RP0/CPU0:ios(config-dhcpv4-relay-profile)# interface GigabitEthernet0/0/0/2 relay
profile r1
RP/0/RP0/CPU0:ios(config-dhcpv4)# commit
```

Running Configuration

```
RP/0/RP0/CPU0:ios# show running-config dhcp ipv4
Tue Aug 29 07:30:50.677 UTC
dhcp ipv4
 profile r1 relay
  helper-address vrf default 198.51.100.1 giaddr 198.51.100.3
 !
```

```
 interface GigabitEthernet0/0/0/2 relay profile r1
!
```

DHCP Client

The Dynamic Host Configuration Protocol (DHCP) client functionality enables the router interfaces to dynamically acquire the IPv4 or DHCPv4 or DHCPv6 server, and forwards the responses back to the correct Layer 2 address so that the correct device gets the correct configuration information.

DHCP has the ability to allocate IP addresses only for a configurable period of time, called the lease period. If the client is required to retain this IP address for a longer period beyond the lease period, the lease period must be renewed before the IP address expires. The client renews the lease based on configuration that was sent from the server. The client unicasts a REQUEST message using the IP address of the server. When a server receives the REQUEST message and responds with an ACK message. The lease period of the client is extended by the lease time configured in the ACK message.

Enabling DHCP Client on an Interface

You can enable both the DHCPv4 and DHCPv6 clients at an interface level. The DHCP component receives a notification when DHCPv4 or DHCPv6 is enabled or disabled on an interface.

```
RP/0/RP0/CPU0:ios# configure
Tue Aug 29 09:26:12.468 UTC
RP/0/RP0/CPU0:ios(config)# int mgmtEth 0/RP0/CPU0/0
RP/0/RP0/CPU0:ios(config-if)# ipv4 address dhcp
RP/0/RP0/CPU0:ios(config-if)# commit
Tue Aug 29 09:26:21.715 UTC
RP/0/RP0/CPU0:ios(config-if)# exit
RP/0/RP0/CPU0:ios(config)# int mgmtEth 0/RP0/CPU0/0
RP/0/RP0/CPU0:ios(config-if)# ipv6 address dhcp
dhcp  dhcp-client-options
RP/0/RP0/CPU0:ios(config-if)# ipv6 address dhcp
RP/0/RP0/CPU0:ios(config-if)# commit
Tue Aug 29 09:26:50.159 UTC
```

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 reimage 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 bootloader 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. You must define iPXE in the DHCP server configuration file.

Note To initiate the iPXE boot process, perform one of the following methods:

- Use the **reload bootmedia network location all** command. This method is the preferred method.
- Power cycle the NCS 1020 chassis and start the iPXE boot process in the BIOS interface.

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 ncs1020
   {
   hardware ethernet ab:cd:ef:01:23:45;
   fixed-address <ip address>;
   filename "http://<httpserver-address>/<path-to-image>/ncs1020-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;
        option dhcp-client-identifier "<FCB2437B066>";
          if exists user-class and option user-class = "iPXE" {
          filename "http://10.89.205.127/box1/ncs1020-x64.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.
- Management port of the NCS 1020 chassis is in *UP* state.

Use anyone of the following methods to invoke the iPXE boot process:

- via CLI terminal:

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

  ```
  reload bootmedia network location all
  ```

  Example:

  ```
  RP/0/RP0/CPU0:ios# reload bootmedia network location all
  Wed Jul  6 15:11:33.791 UTC
  Reload hardware module ? [confirm]
  ```

  The following example shows the output of the command:

  ```
  Preparing system for backup. This may take a few minutes especially for large
  configurations.
          Status report: node0_RP0_CPU0: BACKUP INPROGRESS
  RP/0/RP0/CPU0:P1D_DT#   Status report: node0_RP0_CPU0: BACKUP HAS COMPLETED SUCCESSFULLY

  [Done]
  [FAILED] Failed unmounting /mnt/fuse/parser_server.
  [  OK  ] Unmounted /mnt/fuse/ftp.
  [  OK  ] Unmounted /mnt/fuse/nvgen_server.
  [  OK  ] Unmounted /boot/efi.
  [  OK  ] Unmounted /selinux.
  .
  .
  Output Snipped
  .
  .
  ..         *** Sirius ***
  System Initializing..
  ..

  ERROR: Class:0; Subclass:10000; Operation: 1004
  ```

```
Shelf Assembly Reset
Shelf Assembly Reset for P1


..         *** Sirius ***
System Initializing..
..

ERROR: Class:0; Subclass:10000; Operation: 1004
.
.
Output Snipped
.
.

NCS1010, Initializing Devices

Booting from Primary Flash
Aldrin: Programmed MI 10
.
.
Output Snipped
.
.
Version 2.19.1266. Copyright (C) 2022 American Megatrends, Inc.
BIOS Date: 05/20/2022 10:47:39 Ver: 0ACHI0410
Press <DEL> or <ESC> to enter setup.
TAM Chipguard Validate Observed DB Error: 0x48

WARNING!!! TAM: Empty Chip DB


Software Boot OK, Validated

iPXE initialising devices...ok


iPXE 1.0.0+ (c2215) -- Open Source Network Boot Firmware -- http://ipxe.org
Features: DNS HTTP TFTP VLAN EFI ISO9660 ISO9660_grub Menu
Trying net0-2051,net0-2052 and net0-2053...
net0-2051: 68:9e:0b:b8:71:1e using NII on NII-PCI06:00.0 (open)
  [Link:down, TX:0 TXE:0 RX:0 RXE:0]
  [Link status: Unknown (http://ipxe.org/1a086194)]
Configuring (net0-2051 68:9e:0b:b8:71:1e)................... Error 0x040ee186
(http://ipxe.org/040ee186)
net0-2052: 68:9e:0b:b8:71:1f using NII on NII-PCI06:00.0 (open)
  [Link:up, TX:0 TXE:0 RX:18 RXE:14]
  [RXE: 8 x "Operation not supported (http://ipxe.org/3c086083)"]
  [RXE: 3 x "Error 0x440e6083 (http://ipxe.org/440e6083)"]
  [RXE: 3 x "The socket is not connected (http://ipxe.org/380f6093)"]
Configuring (net0-2052 68:9e:0b:b8:71:1f)................... ok
net0: fe80::6a9e:bff:feb8:711e/64
net1: fe80::6a9e:bff:feb8:7121/64 (inaccessible)
net2: fe80::6a9e:bff:feb8:7122/64 (inaccessible)
net3: fe80::6a9e:bff:feb8:7123/64 (inaccessible)
net0-2051: fe80::6a9e:bff:feb8:711e/64
net0-2051: 2001:420:5446:2014::281:0/119 gw fe80::676:b0ff:fed8:c100 (no address)
net0-2051: 2002:420:54ff:93:6a9e:bff:feb8:711e/64 gw fe80::fa4f:57ff:fe72:a640
net0-2052: 10.4.33.44/255.255.0.0 gw 10.4.33.1
net0-2052: fe80::6a9e:bff:feb8:711e/64
net0-2053: fe80::6a9e:bff:feb8:711e/64
Filename: http://10.4.33.51/P1D_DT_05/ncs1010-x64.iso
```

```
http://10.4.33.51/P1D_DT_05/ncs1010-x64.iso... ok
.
.
Output Snipped
.
.
User Access Verification

Username: cisco
Password:
```

- via BIOS interface:

1. Reboot NCS 1020 using power cycle or console.
2. Press **Esc** to enter BIOS.
3. Select the **Save & Exit** tab of BIOS.
4. Choose **UEFI: iPXE Network Boot**.

   The following example shows the output of the command:

```
Preparing system for backup. This may take a few minutes especially for large
configurations.
        Status report: node0_RP0_CPU0: BACKUP INPROGRESS
RP/0/RP0/CPU0:P1D_DT#   Status report: node0_RP0_CPU0: BACKUP HAS COMPLETED
SUCCESSFULLY
[Done]
[FAILED] Failed unmounting /mnt/fuse/parser_server.
[  OK  ] Unmounted /mnt/fuse/ftp.
[  OK  ] Unmounted /mnt/fuse/nvgen_server.
[  OK  ] Unmounted /boot/efi.
[  OK  ] Unmounted /selinux.
.
.
Output Snipped
.
.
..         *** Sirius ***
System Initializing..
..

ERROR: Class:0; Subclass:10000; Operation: 1004

Shelf Assembly Reset
Shelf Assembly Reset for P1


..         *** Sirius ***
System Initializing..
..

ERROR: Class:0; Subclass:10000; Operation: 1004
.
.
Output Snipped
.
.

NCS1010, Initializing Devices

Booting from Primary Flash
Aldrin: Programmed MI 10
.
```

```
.
Output Snipped
.
.
Version 2.19.1266. Copyright (C) 2022 American Megatrends, Inc.
BIOS Date: 05/20/2022 10:47:39 Ver: 0ACHI0410
Press <DEL> or <ESC> to enter setup.
TAM Chipguard Validate Observed DB Error: 0x48

WARNING!!! TAM: Empty Chip DB


Software Boot OK, Validated

iPXE initialising devices...ok


iPXE 1.0.0+ (c2215) -- Open Source Network Boot Firmware -- http://ipxe.org
Features: DNS HTTP TFTP VLAN EFI ISO9660 ISO9660_grub Menu
Trying net0-2051,net0-2052 and net0-2053...
net0-2051: 68:9e:0b:b8:71:1e using NII on NII-PCI06:00.0 (open)
  [Link:down, TX:0 TXE:0 RX:0 RXE:0]
  [Link status: Unknown (http://ipxe.org/1a086194)]
Configuring (net0-2051 68:9e:0b:b8:71:1e).................. Error 0x040ee186
(http://ipxe.org/040ee186)
net0-2052: 68:9e:0b:b8:71:1f using NII on NII-PCI06:00.0 (open)
  [Link:up, TX:0 TXE:0 RX:18 RXE:14]
  [RXE: 8 x "Operation not supported (http://ipxe.org/3c086083)"]
  [RXE: 3 x "Error 0x440e6083 (http://ipxe.org/440e6083)"]
  [RXE: 3 x "The socket is not connected (http://ipxe.org/380f6093)"]
Configuring (net0-2052 68:9e:0b:b8:71:1f).................. ok
net0: fe80::6a9e:bff:feb8:711e/64
net1: fe80::6a9e:bff:feb8:7121/64 (inaccessible)
net2: fe80::6a9e:bff:feb8:7122/64 (inaccessible)
net3: fe80::6a9e:bff:feb8:7123/64 (inaccessible)
net0-2051: fe80::6a9e:bff:feb8:711e/64
net0-2051: 2001:420:5446:2014::281:0/119 gw fe80::676:b0ff:fed8:c100 (no address)
net0-2051: 2002:420:54ff:93:6a9e:bff:feb8:711e/64 gw fe80::fa4f:57ff:fe72:a640
net0-2052: 10.4.33.44/255.255.0.0 gw 10.4.33.1
net0-2052: fe80::6a9e:bff:feb8:711e/64
net0-2053: fe80::6a9e:bff:feb8:711e/64
Filename: http://10.4.33.51/P1D_DT_05/ncs1010-x64.iso
http://10.4.33.51/P1D_DT_05/ncs1010-x64.iso... ok
.
.
Output Snipped
.
.
User Access Verification

Username: cisco
Password:
```

Boot Using Zero Touch Provisioning

ZTP allows you to provision the network device with day 0 configurations and supports both management ports and data ports.

ZTP provides multiple options, such as:

- Automatically apply specific configuration in a large-scale environment.
- Download and install specific IOS XR image.
- Install specific application package or third party applications automatically.
- Deploy containers without manual intervention.
- Upgrade or downgrade software versions effortlessly on thousands of network devices at a time

Benefits of Using ZTP

ZTP helps you manage large-scale service providers infrastructures effortlessly. Following are the added benefits of using ZTP:

- ZTP helps you to remotely provision a router anywhere in the network. Thus eliminates the need to send an expert to deploy network devices and reduces IT cost.
- Automated provisioning using ZTP can remove delay and increase accuracy and thus is cost-effective and provides better customer experience.

  By automating repeated tasks, ZTP allows network administrators to concentrate on more important stuff.
- ZTP process helps you to quickly restore service. Rather than troubleshooting an issue by hand, you can reset a system to well-known working status.

Prerequisites:

ZTP does not execute, if a username is already configured in the system.

ZTP is initiated in one of the following ways:

- **Automated Fresh Boot:**

  Fresh Boot: When you boot the device, the ZTP process initiates automatically if the device does not have a prior configuration. During the process, the router receives the details of the configuration file from the DHCP server. Use this method for devices that has no pre-loaded configuration. See Fresh Boot Using DHCP, on page 12.

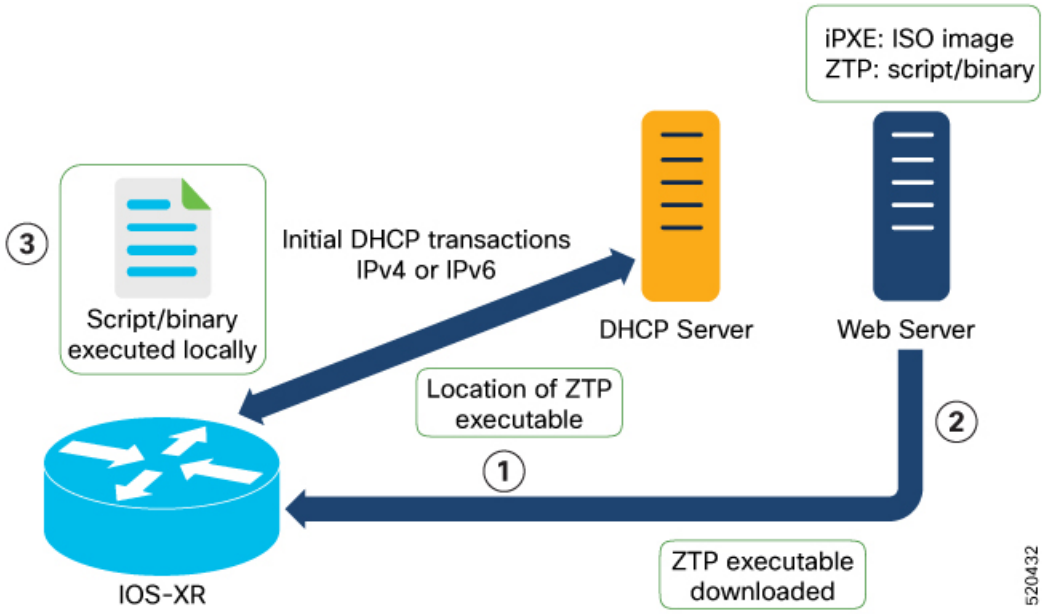
  You must define the configuration file or the bootscript that is downloaded from the DHCP server:

- **Configuration File**: The first line of the file must contain **!! IOS XR configuration**", to process the file as a configuration. If you are trying to bring up ten new nodes, you have to define ten configuration files. See Build your Configuration File, on page 14.
- **ZTP Bootscript**: Define the script to be executed on every boot. See Configure ZTP BootScript, on page 15 .
- **Manual Invocation using CLI:** Use this method when you want to forcefully initiate ZTP on a fully configured device, using CLI. See Invoke ZTP Manually through CLI, on page 16.

Fresh Boot Using DHCP

The ZTP process initiates when you boot the network-device with an IOS-XR image. The process starts only on the device that doesn't have a prior configuration.

This image depicts the high-level work flow of the ZTP process:



1. ZTP sends DHCP request to fetch the ZTP configuration file or user script. To help the Bootstrap server uniquely identify the device, ZTP sends below DHCP option.
   - DHCP(v4/v6) client-id=Serial Number
   - DHCPv4 option 124: Vendor, Platform, Serial-Number
   - DHCPv6 option 16: Vendor, Platform, Serial-Number

   The following is the default sequential flow of the ZTP process:
   - ZTP sends IPv4 DHCP request first on all the management port. In case there is a failure, then ZTP sends IPv6 DHCP request on all the management port.
   - ZTP sends IPv4 DHCP request first on all the data port. In case there is a failure, then ZTP sends IPv6 DHCP request on all the data port.

     The default sequential flow is defined in configuration file and you can modify the sequence using the configuration file.

2. DHCP server identifies the device and responds with DHCP response using one of the following options:

   DHCP server should be configured to respond with the DHCP options.
   - DHCPv4 using BOOTP filename to supply script/config location.
   - DHCPv4 using Option 67 (bootfile-name) to supply script/config location.
   - DHCPv6 using Option 59 (OPT_BOOTFILE_URL) to supply script/config location

3. The network device downloads the file from the web server using the URL location that is provided in the DHCP response.
4. The device receives a configuration file or script file from the HTTP server.

Note

- If the downloaded file content starts with !! IOS XR it is considered as a configuration file.
- If the downloaded file content starts with #! /bin/bash, #! /bin/sh or #!/usr/bin/python it is considered as a script file.

5. The device applies the configuration file or executes the script or binary in the default bash shell.
6. The Network device is now up and running.

Build your Configuration File

Based on the business need, you can use a configuration or script file to initiate the ZTP process.

The configuration file content starts with !! IOS XR.

The following is the sample configuration file. You can automate all the configurations. For more information on creating ZTP configuration file, refer ZTP Configuration Files Creation.

```
Tue May 4 18:08:59.544 UTC
Building configuration...
!! IOS XR Configuration 7.7.1.22I
!! Last configuration change at Tue May 4 17:12:47 2021 by cisco
!
line console
exec-timeout 0 0
!
line default
exec-timeout 0 0
session-timeout 0
!
vty-pool default 0 20
alias alarms show alarms brief system active
interface MgmtEth0/RP0/CPU0/0
ipv4 address dhcp
no shut
!
interface MgmtEth0/RP0/CPU0/1
description noshut-interface-ztp
ipv4 address 10.127.60.160 255.255.255.0
no shut
!
interface MgmtEth0/RP0/CPU0/2
description noshut-interface-ztp
no shut
!
interface PTP0/RP0/CPU0/0
description noshut-interface-ztp
no shut
Cisco NCS 1020 System Setup and Software Installation Guide, IOS XR Release 7.7.x
19
Bring-up Cisco NCS 1020
Build your Configuration File
!
telnet vrf default ipv4 server max-servers 100a
ssh server v2
ssh server netconf vrf default
netconf-yang agent
ssh
```

```
!
netconf agent tty
grpc
router static
address-family ipv4 unicast
0.0.0.0/0 10.127.60.1
end
```

Configure ZTP BootScript

ZTP 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 script. You can either use the ZTP bash script or the ZTP configuration file.

You can either use the ZTP bash script or the ZTP configuration file.

If you want to hardcode a script to be executed every boot, configure the following.

```
Router#configure
Router(config)#ztp bootscript /disk0:/myscript
Router(config)#commit
```

The above configuration waits for the first data-plane interface to be configured and then wait an extra minute for the management interface to be configured with an IP address, to ensure that we have connectivity in the third-party namespace for applications to use. If the delay is not desired, use:

```
Router#configure
Router(config)#ztp bootscript preip /disk0:/myscript
Router(config)#commit
```

Note When the above command is first configured, you will be prompted if you wish to invoke it now. The prompt helps with testing.

This is the example content of **/disk0:/myscript**:

```
host ncs1020_P1B_DT_08_ETH0 {
#hardware ethernet 68:9e:0b:b8:6f:5c ;
option dhcp-client-identifier "FCB2437B05N" ;
if exists user-class and option user-class = "iPXE" {
filename "http://10.33.0.51/P1B_DT_08/ncs1020-x64.iso";
} else {
filename "http://10.33.0.51/P1B_DT_08/startup.cfg";
}
fixed-address 10.33.0.19;
}
```

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

```
#! /bin/bash
#
# NCS1020 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.

```
Tue May 4 18:08:59.544 UTC
Building configuration...
!! IOS XR Configuration 7.7.1.22I
!! Last configuration change at Tue May 4 17:12:47 2021 by cisco
!
line console
exec-timeout 0 0
!
line default
exec-timeout 0 0
session-timeout 0
!
vty-pool default 0 20
alias alarms show alarms brief system active
interface MgmtEth0/RP0/CPU0/0
ipv4 address dhcp
no shut
!
interface MgmtEth0/RP0/CPU0/1
description noshut-interface-ztp
ipv4 address 10.127.60.160 255.255.255.0
no shut
!
interface MgmtEth0/RP0/CPU0/2
description noshut-interface-ztp
no shut
!
interface PTP0/RP0/CPU0/0
description noshut-interface-ztp
no shut
!
interface PTP0/RP0/CPU0/1
description noshut-interface-ztp
no shut
end
```

Invoke ZTP Manually through CLI

Manual ZTP can be invoked through CLI commands. This manual way helps you to provision the router in stages. Ideal for testing out ZTP configuration without a reboot. If you want to invoke a ZTP on an interface (data ports or management port), you don't have to bring up and configure the interface first. You can execute the ztp initiate command, even if the interface is down, ZTP script brings it up and invoke dhclient. So ZTP could run over all interfaces no matter it is up or down.

Use the ztp initiate, ztp terminate, and ztp clean commands to force ZTP to run over more interfaces.

- ztp initiate—Invokes a new ZTP DHCP session. Logs can be found in /disk0:/ztp/ztp.log.
- ztp terminate—Terminates any ZTP session in progress.
- ztp clean—Removes only the ZTP state files.

The log file ztp.log is saved in /var/log/ztp.log folder, and a copy of log file is available at /disk0:/ztp/ztp.log location using a soft link. However, executing ztp clean clears files saved on disk and not on /var/logztp.log folder where current ZTP logs are saved. In order to have a log from current ZTP run, you must manually clear the ZTP log file from /var/log/ztp.log folder.

Procedure

Step 1 (optional) **ztp clean**

Example:

```
RP/0/RP0/CPU0:ios#ztp clean
Fri Apr 29 06:49:29.760 UTC
This would remove all ZTP temporary files.
Would you like to proceed? [no]: yes
All ZTP operation files have been removed.
ZTP logs are present in /var/log/ztp*.log for logrotate.
Please remove manually if needed.
If you now wish ZTP to run again from boot, do 'conf t/commit replace' followed by reload.
```

Removes all the ZTP logs and saved settings.

Step 2 **ztp initiate**

Example:

```
RP/0/RP0/CPU0:ios#ztp initiate
Fri Jun 17 11:44:08.791 UTC
Initiating ZTP may change your configuration.
Interfaces might be brought up if they are in shutdown state
Would you like to proceed? [no]: yes
ZTP will now run in the background.
Please use "show logging" or look at /var/log/ztp.log to check progress.
RP/0/RP0/CPU0:ios#
```

Use the **show logging** command or see the /var/log/ztp.log to check progress.

Reboots the Cisco NCS 1020 system.

Step 3 (Optional) **ztp terminate**

Example:

```
RP/0/RP0/CPU0:ios#ztp terminate
Fri Apr 29 06:38:59.238 UTC
This would terminate active ZTP session if any (this may leave your system in a partially configured
 state)
Would you like to proceed? [no]: yes
Terminating ZTP
No ZTP process running
```

Terminates the ZTP process.

Invoke ZTP Through Reload

The ZTP process can be automatically invoked by using the reload command.

Procedure

Step 1 **configure**

Example:

```
RP/0/RP0/CPU0:P2B_DT_02#configure
```

Enters the configuration mode.

Step 2 **commit replace**

Example:

```
Fri Apr 29 06:48:46.236 UTC
RP/0/RP0/CPU0:P2B_DT_02(config)#commit replace
Fri Apr 29 06:48:53.199 UTC

This commit will replace or remove the entire running configuration. This
operation can be service affecting.
Do you wish to proceed? [no]: yes
RP/0/RP0/CPU0:ios(config)#
RP/0/RP0/CPU0:ios(config)#end
```

Removes the entire running configuration.

Step 3 **ztp clean**

Example:

```
RP/0/RP0/CPU0:ios#ztp clean
Fri Apr 29 06:49:29.760 UTC
This would remove all ZTP temporary files.
Would you like to proceed? [no]: yes
All ZTP operation files have been removed.
ZTP logs are present in /var/log/ztp*.log for logrotate.
Please remove manually if needed.
If you now wish ZTP to run again from boot, do 'conf t/commit replace' followed by reload.
```

Removes all the ZTP logs and saved settings.

Step 4 **reload**

Example:

```
RP/0/RP0/CPU0:ios#reload
Fri Apr 29 06:50:12.312 UTC
Proceed with reload? [confirm]

RP/0/RP0/CPU0:ios#
Preparing system for backup. This may take a few minutes especially for large configurations.
 Status report: node0_RP0_CPU0: BACKUP INPROGRESS
 Status report: node0_RP0_CPU0: BACKUP HAS COMPLETED SUCCESSFULLY
[Done]
```

After the node comes up, you can check that the ZTP is initiated and the configuration has been restored successfully.

```
RP/0/RP0/CPU0:Apr 29 06:55:33.242 UTC: pyztp2[377]: %INFRA-ZTP-4-CONFIG_INITIATED : ZTP has initiated
 config load and commit operations
RP/0/RP0/CPU0:Apr 29 06:55:39.263 UTC: ifmgr[381]: %PKT_INFRA-LINK-3-UPDOWN : Interface
GigabitEthernet0/0/0/0, changed state to Down
RP/0/RP0/CPU0:Apr 29 06:55:39.287 UTC: osa_driver[183]: %PKT_INFRA-FM-4-FAULT_MINOR : ALARM_MINOR
:PROV-INPROGRESS :DECLARE :GigabitEthernet0/0/0/0:
RP/0/RP0/CPU0:Apr 29 06:55:39.287 UTC: osa_driver[183]: %PKT_INFRA-FM-4-FAULT_MINOR : ALARM_MINOR
:PROV-INPROGRESS :DECLARE :Osc0/0/0/0:
RP/0/RP0/CPU0:Apr 29 06:55:39.287 UTC: ifmgr[381]: %PKT_INFRA-LINK-3-UPDOWN : Interface
GigabitEthernet0/0/0/0, changed state to Up
```

```
RP/0/RP0/CPU0:Apr 29 06:55:39.716 UTC: osa_driver[183]: %PKT_INFRA-FM-4-FAULT_MINOR : ALARM_MINOR
:PROV-INPROGRESS :CLEAR :Osc0/0/0/0:
RP/0/RP0/CPU0:Apr 29 06:55:39.728 UTC: osa_driver[183]: %PKT_INFRA-FM-4-FAULT_MINOR : ALARM_MINOR
:PROV-INPROGRESS :CLEAR :GigabitEthernet0/0/0/0:
RP/0/RP0/CPU0:Apr 29 06:55:47.904 UTC: osa_driver[183]: %PKT_INFRA-FM-4-FAULT_MINOR : ALARM_MINOR
:PROV-INPROGRESS :DECLARE :Ots0/0/0/1:

User Access Verification

Username: cisco
Password:
ios con0/RP0/CPU0 is now available
```

Reboots the Cisco NCS 1020 system.

ZTP Logging

ZTP logs its operation on the flash file system in the directory /disk0:/ztp/. ZTP logs all the transaction with the DHCP server and all the state transition.

The following example displays the execution of a simple configuration script downloaded from a data interface using the command ztp initiate interface Ten 0/0/0/0 verbose, this script unshuts all the interfaces of the system and configure a load interval of 30 seconds on all of them.

```
2022-06-17 11:52:34,682  19292 [Xr           ] INF: Downloading the file to /tmp/ztp.script
2022-06-17 11:52:35,329  19292 [Report       ] INF: User script downloaded successfully.
Provisioning in progress.
2022-06-17 11:52:35,330  19292 [Engine       ] DEB: ZAdmin, current state:active. Processing
 work: Config device work for ZAdmin. done = False
2022-06-17 11:52:35,330  19292 [ZAdmin       ] DEB: Proceeding to provision the router
2022-06-17 11:52:35,331  19292 [Engine       ] DEB: ZAdmin, current state:active. Processing
 work: ZAdmin: Apply configuration. done = False
2022-06-17 11:52:35,331  19292 [Engine       ] INF: ZAdmin, current state:active: state tag
 changed to provision
RP/0/RP0/CPU0:Jun 17 11:52:35.341 UTC: pyztp2[140]: %INFRA-ZTP-4-CONFIG_INITIATED : ZTP has
 initiated config load and commit operations
2022-06-17 11:52:35,339  19292 [Env          ] DEB: No MTU configs detected
2022-06-17 11:52:35,340  19292 [Engine       ] DEB: ZAdmin, current state:active. Processing
 work: ZAdmin: Apply configuration. done = False
2022-06-17 11:52:35,354  19292 [Xr           ] DEB: Will apply the following config:
/disk0:/ztp/customer/config.candidate
2022-06-17 11:52:35,354  19292 [Xr           ] INF: Applying user configurations
2022-06-17 11:52:35,355  19292 [Configuration] INF: Provisioning via config replace
2022-06-17 11:52:54,656  19292 [Configuration] INF: Configuration has been applied
2022-06-17 11:52:54,656  19292 [Engine       ] DEB: ZAdmin, current state:active. Processing
 work: Sending standby sync message. done = False
2022-06-17 11:52:54,663  19292 [Engine       ] DEB: ZAdmin, current state:active. Processing
 work: [privileged] getting engine status. done = False
2022-06-17 11:52:54,664  19292 [Engine       ] DEB: ZAdmin, current state:active. Processing
 work: ZAdmin: Execute post-configuration script. done = False
2022-06-17 11:52:55,212  19292 [Env          ] INF: Env::cleanup, success:True, exiting:False
2022-06-17 11:52:55,213  19292 [ZtpHelpers   ] DEB: Executing: source /pkg/bin/ztp_helper.sh
 && echo -ne  | xrcmd "show running-config"
2022-06-17 11:52:55,825  19292 [Env          ] INF: Executing command ip netns exec
vrf-default /sbin/dhclient -4 -cf /etc/dhcp/dhclient.conf.ztp -lf
/var/lib/dhcp/dhclient.leases.ztp -sf /etc/dhcp/dhclient-script.ztp2 -r Mg0_RP0_CPU0_0 to
release IP
2022-06-17 11:52:56,968  19292 [Xr           ] INF: Removing linux route with ip 10.33.0.63
2022-06-17 11:52:57,023  19292 [Engine       ] INF: ZAdmin, current state:active, exit
code:success
2022-06-17 11:52:57,023  19292 [Engine       ] INF: ZAdmin, current state:final, exit
```

```
code:success: state changed to final
2022-06-17 11:52:59,737  19292 [Engine       ] DEB: ZAdmin, current state:final, exit
code:success. Processing work: Sending standby sync message. done = False
2022-06-17 11:52:59,738  19292 [Engine       ] WAR: ZAdmin, current state:final, exit
code:success: work is ignored: work=<desc='Sending standby sync message' done=False
priv=False>
2022-06-17 11:52:59,738  19292 [Engine       ] DEB: ZAdmin, current state:final, exit
code:success. Processing work: [privileged] getting engine status. done = False
2022-06-17 11:53:04,744  19292 [main     ] DEB: Moved to final state
2022-06-17 11:53:04,745  19292 [main     ] DEB: ZTP completed successfully
2022-06-17 11:53:04,745  19292 [main     ] INF: Exiting SUCCESSFULLY
2022-06-17 11:53:04,746  19292 [main     ] DEB: Exiting. Will not retry now.
2022-06-17 11:53:04,746  19292 [main    ] DEB: Shutting down adaptor. Cleanup False. Exiting
 False
2022-06-17 11:53:04,748  19292 [Engine       ] DEB: ZAdmin, current state:final, exit
code:success. Processing work: [privileged] prepare engine shutdown. done = False
2022-06-17 11:53:04,849  19292 [Engine       ] DEB: ZAdmin, current state:final, exit
code:success. Processing work: [privileged] shutting down ZAdmin engine. done = False
2022-06-17 11:53:04,849  19292 [Engine       ] INF: ZAdmin, current state:final, exit
code:shutdown
2022-06-17 11:53:04,849  19292 [Engine      ] INF: ZAdmin, exit code:shutdown: state changed
 to None
2022-06-17 11:53:04,849  19292 [Engine       ] DEB: ZAdmin, exit code:shutdown: breaking
engine loop after shutdown
2022-06-17 11:53:04,850  19292 [Engine      ] DEB: ZAdmin, exit code:shutdown: end of event
 loop
2022-06-17 11:53:04,850  19292 [Adaptor      ] DEB: Adaptor : Cleanup for admin context on
 Terminate
2022-06-17 11:53:06,119  19292 [main     ] INF: Exiting SUCCESSFULLY
2022-06-17 11:53:06,119  19292 [main     ] INF: ZTP Exited
RP/0/RP0/CPU0:Jun 17 11:53:06.119 UTC: pyztp2[140]: %INFRA-ZTP-4-EXITED : ZTP exited
```

Generate Tech Support Information for ZTP

When you have a problem in the ztp process that you cannot resolve, the resource of last resort is your Cisco Systems technical support representative. To analyze a problem, your technical support representative needs certain information about the situation and the symptoms that you are experiencing. To speed up the problem isolation and resolution process, collect the necessary data before you contact your representative.

Use the **show tech-support ztp** command to collect all debugging information of ztp process.

Example:

```
RP/0/RP0/CPU0:R1#show tech-support ztp
Thu Jul 28 08:33:27.531 UTC
++ Show tech start time: 2022-Jul-28.083327.UTC ++
Thu Jul 28 08:33:28 UTC 2022 Waiting for gathering to complete
..
Thu Jul 28 08:33:34 UTC 2022 Compressing show tech output
Show tech output available at 0/RP0/CPU0 :
/harddisk:/showtech/showtech-R1-ZTP-2022-Jul-28.083327.UTC.tgz
++ Show tech end time: 2022-Jul-28.083334.UTC ++
RP/0/RP0/CPU0:R1#
```

In the above example, the tech support information is saved as .tgz file in the specified location. This information can be shared with the Cisco Technical Support representatives for troubleshooting the ztp process.

Configure Management Interface

The management interface can be used for system management and remote communication. To use the management interface for system management, you must configure an IP address and subnet mask. To use the management interface for remote communication, you must configure a static route. Use this procedure when NCS 1020 chassis is not booted using ZTP.

Before you begin

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

Procedure

Step 1 **configure**

Example:

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

Enters IOS 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 management interface.

Step 4 **no shutdown**

Example:

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

Places the management 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** *0.0.0.0/0 default-gateway*

Example:

```
RP/0/RP0/CPU0:ios(config)#router static address-family ipv4 unicast 0.0.0.0/0 198.51.100.4
```

Specifies the IP address of the default gateway to configure a static route. This IP address must be used for communication 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

Connect the management interface to the Ethernet network. Establish a SSH or Telnet connection to the management interface using its IP address.

Link Layer Discovery Protocol Support on Management Interface

The Link Layer Discovery Protocol (LLDP) support on management interface feature requires a system to form LLDP neighbor relationship over the system management interface. It advertises and learns the LLDP neighbor information through this system. This information about neighbors is then used to learn about the neighbors as well as the topology of the devices for Operations, Administration, and Maintenance (OAM) purposes.

Note Slot-0 and Slot-1 are provisioned for LLDP in NCS 1020.

Advantages of LLDP

- Provides support on both Cisco and non-Cisco devices.
- Enables neighbor discovery between Cisco and non-Cisco devices.

Limitation

- When you disable LLDP globally, the LLDP gets disabled on all the interfaces.

Note By default, LLDP is enabled for NCS 1020. But when you enable and disable LLDP in the global configuration mode, LLDP gets disabled on all the interfaces. To enable it again you must enable LLDP globally or reload NCS 1020.

Table 1: Comparison of Cisco Discovery Protocol (CDP) and LLDP

CDP	LLDP
The CDP is a device discovery protocol that runs over Layer 2. Layer 2 is also known as the data link layer that runs on all Cisco devices, such as routers, bridges, access servers, and switches. This protocol allows the network management applications to automatically discover and learn about other Cisco devices that connect to the network.	The LLDP is also a device discovery protocol that runs over Layer 2. This protocol allows the network management applications to automatically discover and learn about other non-Cisco devices that connect to the network.

Interoperability between Non-Cisco Devices Using LLDP

LLDP is also a neighbor discovery protocol that is used by network devices to advertise information about themselves to other devices on the network. This protocol runs over the data link layer, which allows two systems running different network layer protocols to learn about each other.

Neighbor Discovery

System advertises the LLDP TLV (Type Length Value) details over the management network using which other devices in the management network can learn about this device.

Considerations for LLDP Configuration

- LLDP full stack functionality is supported on all the three management interfaces that are supported in NCS 1020.
- You can selectively enable or disable LLDP on any of the management interfaces.
- You can selectively enable or disable LLDP transmit or receive functionality at the management interface level.
- LLDP operational data is available on both the CLI and NETCONF-YANG interfaces.

Global LLDP Attributes

The following table describes the global LLDP attributes that you can configure:

Table 2: Global LLDP Attributes

Attribute	Default	Range	Description
Holdtime	120 seconds	0–65535 seconds	Specifies the holdtime (in sec). Holdtime refers to the time or duration that an LLDP device maintains the neighbor information before discarding.
Reinit	2 seconds	2–5 seconds	Delay (in sec) for LLDP initialization on any interface

Attribute	Default	Range	Description
Timer	30 seconds	5–65534 seconds	Specifies the rate at which LLDP packets are sent (in sec)

Enabling LLDP Globally

When you enable LLDP globally, all interfaces that support LLDP are automatically enabled for both transmit and receive operations.

You can override this default operation at the interface to disable receive or transmit operations.

Note Two additional GigabitEthernet based interfaces are enabled as part of the newly provisioned Slot-1 as given in the example below.

```
GigabitEthernet0/1/0/0 unassigned Down Down default
GigabitEthernet0/1/0/2 unassigned Down Down default
```

The following example shows the commands to configure LLDP globally. The global LLDP configuration enables LLDP on all the three management interfaces.

```
RP/0/RP0/CPU0:regen#configure terminal
RP/0/RP0/CPU0:regen(config)#lldp management enable
RP/0/RP0/CPU0:regen(config)#lldp holdtime 30
RP/0/RP0/CPU0:regen(config)#lldp reinit 2
RP/0/RP0/CPU0:regen(config)#commit
```

Verification

You can verify the LLDP configuration using the **show running-config lldp** command.

The output of **show running-config lldp** command is as follows:

```
RP/0/RP0/CPU0:regen#show running-config lldp
Tue Dec 10 10:36:11.567 UTC
lldp
timer 30
reinit 2
holdtime 120
management enable
!
```

You can verify the LLDP data using the **show lldp interface** and **show lldp neighbors** commands.

The output of **show lldp interface** command is as follows:

```
RP/0/RP0/CPU0:regen#show lldp interface
Thu Nov  7 08:45:22.934 UTC


MgmtEth0/RP0/CPU0/0:
        Tx: enabled
        Rx: enabled
        Tx state: IDLE
        Rx state: WAIT FOR FRAME


MgmtEth0/RP0/CPU0/1:
        Tx: enabled
        Rx: enabled
```

```
        Tx state: IDLE
        Rx state: WAIT FOR FRAME
```

The output of **show lldp neighbors** command is as follows:

```
RP/0/RP0/CPU0:M-131#show lldp neighbors
Mon Dec  2 11:01:20.143 CET
Capability codes:
        (R) Router, (B) Bridge, (T) Telephone, (C) DOCSIS Cable Device
        (W) WLAN Access Point, (P) Repeater, (S) Station, (O) Other

Device ID       Local Intf              Hold-time  Capability     Port ID
[DISABLED]      MgmtEth0/RP0/CPU0/0     120        B               gi19
MYS-130         MgmtEth0/RP0/CPU0/1     120        R               MgmtEth0/RP0/CPU0/1
```

where [DISABLED] shows that the LLDP is disabled on the interface MgmtEth0/RP0/CPU0/0.

Note If the RCOM interface is enabled, the output of **show lldp neighbors** command would include the entries for both LLDP neighbours and remote connect neighbours.

Enable LLDP for Each Management Interface

The following example shows the commands to configure LLDP at the management interface level.

```
RP/0/RP0/CPU0:ios(config)#interface mgmtEth 0/RP0/CPU0/X
RP/0/RP0/CPU0:ios(config-if)#lldp enable
RP/0/RP0/CPU0:ios(config-if)#commit
```

Disabling LLDP Transmit and Receive Operations

The following example shows the commands to disable the LLDP transmit operations at the specified management interface.

```
RP/0/RP0/CPU0:ios(config)#interface mgmtEth 0/RP0/CPU0/X
RP/0/RP0/CPU0:ios(config-if)#lldp transmit disable
RP/0/RP0/CPU0:ios(config-if)#commit
```

The following example shows the commands to disable the LLDP receive operations at the specified management interface.

```
RP/0/RP0/CPU0:ios(config)#interface mgmtEth 0/RP0/CPU0/X
RP/0/RP0/CPU0:ios(config-if)#lldp receive disable
RP/0/RP0/CPU0:ios(config-if)#commit
```

Debugging LLDP Issues

The following commands are used for debugging issues in the LLDP functionality.

- **show lldp traffic**
- **debug lldp all**
- **debug lldp errors**
- **debug lldp events**
- **debug lldp packets**
- **debug lldp tlvs**
- **debug lldp trace**
- **debug lldp verbose**

Configure Telnet

This procedure allows you to establish a telnet session to the management interface using its IP address. Use this procedure when NCS 1020 chassis is not booted using ZTP.

Before you begin

Ensure that two xr-telnet-* rpms are installed..

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). By default, telnet servers are not 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.

Configure SSH

This procedure allows you to establish an SSH session to the management interface using its IP address. Use this procedure when NCS 1020 chassis is not booted using ZTP.

Before you begin

- 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
```

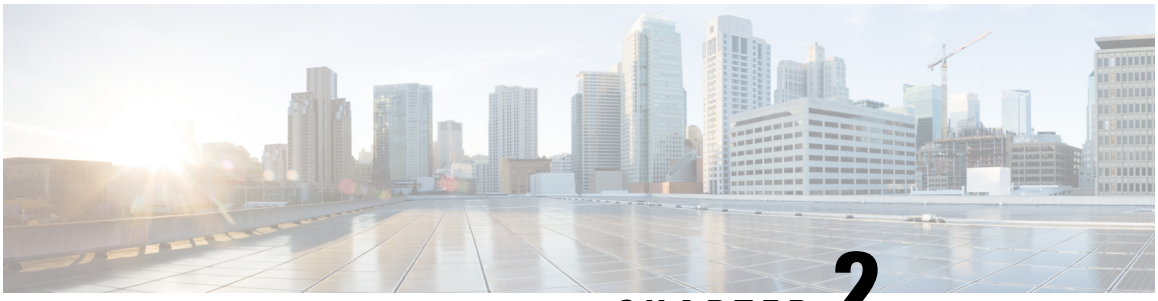
Enables the SSH server to accept only SSHv2 client connections.

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

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

end-Prompts the 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 2

Configure AAA

This chapter describes the implementation of the administrative model of *task-based authorization* used to control user access in the software system. The major tasks required to implement task-based authorization involve configuring TACACS+ and RADIUS servers and groups.

- About TACACS+, on page 29
- Configure TACACS+ Server, on page 29
- Configure TACACS+ Server Groups, on page 30
- About RADIUS, on page 31
- Configure RADIUS Server Groups, on page 32

About TACACS+

The Terminal Access Controller Access Control System Plus (TACACS+) application is designed to enhance the security of the NCS 1020 device by centralizing user validation. It uses AAA commands and can be enabled and configured on NCS 1020 for improved security. TACACS+ provides detailed accounting information and flexible administrative control over user access.

When TACACS+ server is configured and protocol is enabled on the node, the user credentials are authenticated through TACACS+ server. When the user attempts to log into the node, the username and password is forwarded to the configured TACACS+ servers and get authentication status. If the authentication fails through TACACS+ server, the credentials are sent to the node and are authenticated against the node. If the authentication fails against the node, the user is not allowed to log into the node.

Configure TACACS+ Server

Enabling the AAA accounting feature on a switch allows it to track the network services that users are accessing and the amount of network resources they are using. The switch then sends this user activity data to the TACACS+ security server in the form of accounting records. Each record contains attribute-value pairs and is saved on the security server for analysis. This data can be used for network management, client billing, or auditing purposes.

To configure TACACS+ server, perform these steps:

Procedure

Step 1 Enter into the IOS XR configuration mode.

Example:

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

Step 2 Enable the TACACS+ accounting to send a start-record accounting notice at the beginning of a privileged EXEC process and a stop-record at the end.

Example:

```
RP/0/RP0/CPU0:ios(config)#aaa accounting exec default start-stop group TACACS_ALL
```

Step 3 Create a default command accounting method list for accounting services provided by a TACACS+ security server. This list is configured for privilege level commands and set with a stop-only restriction.

Example:

```
RP/0/RP0/CPU0:ios(config)#aaa accounting exec default start-stop group TACACS_ALL
```

Configure TACACS+ Server Groups

Configuring NCS 1020 to use AAA server groups provides a way to group existing server hosts. This allows you to select a subset of the configured server hosts and use them for a particular service. A server group is used in conjunction with a global server-host list. The server group lists the IP addresses of the selected server hosts.

You can enter one or more **server** commands. The **server** command specifies the hostname or IP address of an external TACACS+ server. Once configured, this server group can be referenced from the AAA method lists (used while configuring authentication, authorization, or accounting).

To configure TACACS+ server groups, perform these steps:

Before you begin

For successful configuration, the external server should be accessible at the time of configuration. When configuring the same IP address for global configuration, server-private parameters are required.

Procedure

Step 1 Enter into the IOS XR configuration mode.

Example:

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

Step 2 Create an AAA server-group and enter into the server group sub-configuration mode.

Example:

```
RP/0/RP0/CPU0:ios(config)# aaa group server tacacs+ tacgroup1
```

Step 3 Configure the IP address of the private TACACS+ server for the group server.

Example:

```
RP/0/RP0/CPU0:ios(config-sg-tacacs+)# server-private 10.1.1.1 port 49 key a_secret
```

Note

- You can configure a maximum of 10 TACACS+ private servers in a server group.
- If private server parameters are not specified, global configurations are used. If global configurations are not specified, default values are used.

Step 4 Configure the authentication and encryption key used between NCS 1020 and the TACACS+ daemon running on the TACACS+ server. If no key string is specified, the global value is used.

Example:

```
RP/0/RP0/CPU0:ios(config-sg-tacacs+)# key 7 08984B1A4D0C19157A5F57
```

Step 5 Configure the timeout value that sets the length of time the authentication, authorization, and accounting (AAA) server waits to receive a response from the TACACS+ server.

Example:

```
RP/0/RP0/CPU0:ios(config-sg-tacacs-private)# timeout 4
```

Step 6 Repeat steps 3 to 5 for every private server to be added to the server group.

Step 7 Configure certificate-based authentication for users configured in the TACACS+ server or server groups.

Example:

```
RP/0/RP0/CPU0:ios(config-sg-tacacs-private)#aaa authorization exec default group TACACS_ALL local
```

Step 8 Set the default method list for authentication, and also enables authentication for console in global configuration mode.

Example:

```
RP/0/RP0/CPU0:ios(config-sg-tacacs-private)#aaa authentication login default group TACACS_ALL local
```

Step 9 Commit the changes and exit all the configuration modes.

commit

end

Step 10 Verify the TACACS+ server group configuration details.

Example:

```
RP/0/RP0/CPU0:ios# show tacacs server-groups
```

About RADIUS

Remote Authentication Dial-In User Service (RADIUS) is a distributed client/server system that provides security against unauthorized access in distributed client/server networks. In Cisco's implementation, RADIUS

clients operate on Cisco NCS 1020 and send requests for authentication and accounting to a central RADIUS server that contains all user authentication and network service access information.

Cisco's AAA security paradigm supports RADIUS, which can be used alongside other security protocols like TACACS+, Kerberos, and local username lookup.

Configure RADIUS Server Groups

You can enter one or more **server** commands. The **server** command specifies the hostname or IP address of an external RADIUS server along with port numbers. When configured, this server group can be referenced from the AAA method lists (used while configuring authentication, authorization, or accounting).

You can configure a maximum of 30 servers and private servers each per RADIUS server group. To configure RADIUS server groups, perform these tasks:

Before you begin

Ensure that the external server is accessible at the time of configuration.

Procedure

Step 1 **configure**

Example:

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

Enters mode.

Step 2 **aaa group server radius** *group-name*

Example:

```
RP/0/RP0/CPU0:ios(config)# aaa group server radius radgroup1
```

Groups different server hosts into distinct lists and enters the server group configuration mode.

Step 3 **radius-server** {*ip-address*}

Example:

```
RP/0/RP0/CPU0:ios(config)# radius-server host 192.168.20.0
```

Specifies the hostname or IP address of the RADIUS server host.

Step 4 **auth-port** *port-number*

Example:

```
RP/0/RP0/CPU0:ios(config)#auth-port 1812
```

Specifies the User Datagram Protocol (UDP) destination port for authentication requests; the host is not used for authentication if set to 0. If unspecified, the port number defaults to 1645.

Step 5 **acct-port** *port-number*

Example:

```
RP/0/RP0/CPU0:ios(config)# acct-port 1813
```

Specifies the UDP destination port for accounting requests; the host is not used for accounting if set to 0. If unspecified, the port number defaults to 1646.

Step 6 **key** *string*

Example:

```
RP/0/RP0/CPU0:ios(config-radius-host)#key 7 08984B1A4D0C19157A5F57
```

Specifies the authentication and encryption key used between NCS 1020 and the RADIUS server. This key overrides the global setting of the **radius-server key** command. If no key string is specified, the global value is used.

The key is a text string that must match the encryption key used on the RADIUS server. Always configure the key as the last item in the **radius-server host** command syntax. This is because the leading spaces are ignored, but spaces within and at the end of the key are used. If you use spaces in the key, do not enclose the key in quotation marks unless the quotation marks themselves are part of the key.

Step 7 Repeat steps 4 to 6 for every external radius server to be added to the server group.

—

Step 8 **aaa authentication** {**login**} {**default**} **group** *group-name* **local**

Example:

```
RP/0/RP0/CPU0:ios(config-radius-host)#aaa authentication login default group radius local
```

Specifies the default method list for authentication, and also enables authentication for console in global configuration mode.

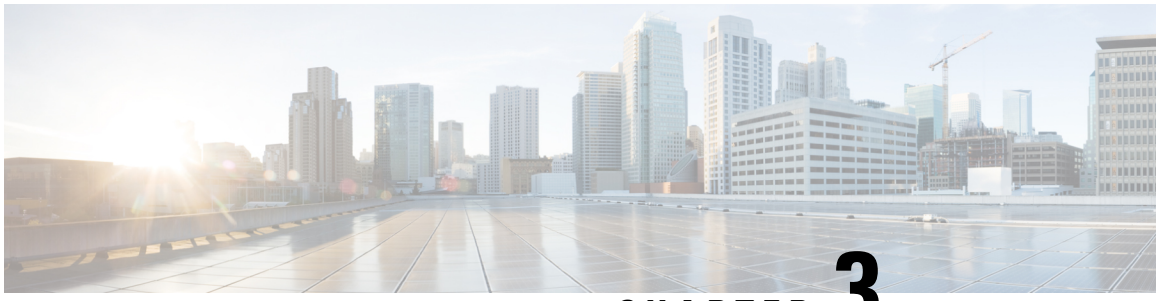
Step 9 Use the **commit** or **end** command.

Step 10 **show radius server-groups** [*group-name* [**detail**]]

Example:

```
RP/0/RP0/CPU0:ios# show radius server-groups
```

(Optional) Displays information about each RADIUS server group that is configured in the system.



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, 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, on page 35
- Verify the Status of the Chassis Door, on page 37
- Verify Inventory, on page 38
- Verify Software Version, on page 41
- Verify Firmware Version, on page 42
- Verify Management Interface Status, on page 45
- Verify Alarms, on page 46
- Verify Environmental Parameters, on page 47
- Verify Context, on page 63
- Verify Core Files, on page 63
- Verify Memory Information, on page 64

Verify Status of Hardware Components

To verify the status of all the hardware components installed on NCS 1020, perform the following procedure.

Before you begin

Ensure that all the required hardware components are installed on NCS 1020. For installation details, see *Cisco Network Convergence System 1020 Hardware Installation Guide*.

Procedure

show platform

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

Example:

```
RP/0/RP0/CPU0:ios#show platform

Mon May  6 16:38:13.609 IST

Node              Type                      State                 Config state

--------------------------------------------------------------------------------

0/RP0/CPU0        NCS1010-CTR2-B-K9(Active) IOS XR RUN             NSHUT,NMON

0/FT0             NCS1010-FAN               OPERATIONAL           NSHUT,NMON

0/FT1             NCS1010-FAN               OPERATIONAL           NSHUT,NMON

0/FT4             NCS1020-FAN               OPERATIONAL           NSHUT,NMON

0/FT5             NCS1020-FAN               OPERATIONAL           NSHUT,NMON

0/FT6             NCS1020-FAN               OPERATIONAL           NSHUT,NMON

0/FT7             NCS1020-FAN               OPERATIONAL           NSHUT,NMON

0/0/NXR0          NCS1K-E-OLT-C             OPERATIONAL           NSHUT,NMON

0/1/NXR0          NCS1010-FLR-P             PRESENT               NSHUT,NMON

0/2/NXR0          NCS1K14-CCMD-16-C         OPERATIONAL           NSHUT,NMON

0/3/NXR0          NCS1K14-CCMD-16-C         OPERATIONAL           NSHUT,NMON

0/4/NXR0          NCS1K14-BLANK             PRESENT               NSHUT,NMON

0/5/NXR0          NCS1K14-BLANK             PRESENT               NSHUT,NMON

0/6/NXR0          NCS1K14-BLANK             PRESENT               NSHUT,NMON

0/7/NXR0          NCS1K14-BLANK             PRESENT               NSHUT,NMON

0/8/NXR0          NCS1K14-BLANK             PRESENT               NSHUT,NMON

0/9/NXR0          NCS1K14-BLANK             PRESENT               NSHUT,NMON

0/PM0             NCS1K4-AC-PSU-2           OPERATIONAL           NSHUT,NMON

0/PM1             NCS1K4-AC-PSU-2           OPERATIONAL           NSHUT,NMON
```

Verify that all the components of NCS 1020 are displayed in output. The state must be in the OPERATIONAL state. The various states are:

- 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 encountered an internal failure.
- PRESENT—Node is in intermediate state in the boot sequence.
- POWERED_OFF—Power is off and the node cannot be accessed.
- IOS XR RUN—Node is running IOS XR.

• OFFLINE—Input power is not connected to the power modules.

Verify the Status of the Chassis Door

To verify the status and alarm condition of the chassis door installed on NCS 1020, perform the following procedure.

Procedure

Step 1 **show platform chassis-door**

Displays the status of the installed chassis door.

Example:

```
RP/0/RP0/CPU0:ios#show platform chassis-door
Mon Jul  1 05:54:59.600 UTC
Chassis door present: Yes
```

Step 2 **environment chassis-door-alarm enable**

Enables the alarm details of the installed chassis door.

Note
By default, the chassis door alarm is disabled.

Example:

```
RP/0/RP0/CPU0:ios#configuration
RP/0/RP0/CPU0:ios(config)#environment chassis-door-alarm enable
RP/0/RP0/CPU0:ios#commit
```

Step 3 **show alarms [brief | detail] system active**

Displays the chassis door information in detail or brief.

Example:

```
RP/0/RP0/CPU0:ios#show alarms brief system active | i Door
Fri May 24 11:26:06.091 UTC
0               Minor        Environ          05/24/2024 11:19:21 UTC    Chassis Door is Open

RP/0/RP0/CPU0:ios#show alarms detail system active | i Door


Fri May 24 11:26:06.091 UTC
Description:             Chassis Door is Open
Location:                0

AID:                     SM/HW_MISC_ERR/45

Tag String:              FAM_FAULT_TAG_HW_ENVMON_CHASSIS_DOOR_OPEN

Module Name:             N/A

EID:                     CHASSIS/LCC/1
```

```
Reporting Agent ID:      65587
Pending Sync:            false
Severity:                Minor
Status:                  Set
Group:                   Environ
Set Time:                05/24/2024 09:56:23 UTC
Clear Time:              -
Service Affecting:       NotServiceAffecting
Transport Direction:     NotSpecified
Transport Source:        NotSpecified
Threshold Value:         -
Current Value:           -
Bucket Type:             NotSpecified
Event Type:              Default
Interface:               N/A

Alarm Name:              Chassis Door alarm
```

The following output shows the alarm details when the chassis door is open.

```
RP/0/RP0/CPU0:May 24 10:03:39.472 UTC: envmon[190]: %PKT_INFRA-FM-4-FAULT_MINOR : ALARM_MINOR :Chassis
 Door alarm :DECLARE :0:
```

The following output shows the alarm details when the chassis door is closed.

```
RP/0/RP0/CPU0:May 24 10:03:35.471 UTC: envmon[190]: %PKT_INFRA-FM-4-FAULT_MINOR : ALARM_MINOR :Chassis
 Door alarm :CLEAR :0:
```

Verify Inventory

The **show inventory** command displays details of the hardware inventory of NCS 1020.

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

Procedure

show inventory

Displays the details of the physical entities of NCS 1020 along with the details of SFPs.

Example:

```
RP/0/RP0/CPU0:ios#show inventory

Mon May  6 16:38:33.857 IST


NAME: "Rack 0", DESCR: "NCS 1020 Shelf Assembly"

PID: NCS1020-SA        , VID: V00, SN: FCB2749B0FD


NAME: "0/RP0/CPU0", DESCR: "NCS 1010, 1012, 1020 Controller with 9600bps console rate"

PID: NCS1010-CTR2-B-K9 , VID: V00, SN: FCB2748B01S
```

```
NAME: "0/RP0-PTP0", DESCR: "Cisco Pluggable Optics Module"
PID: ONS-SI-GE-LX      , VID: V01, SN: AGC1703UE1M

NAME: "0/RP0-PTP1", DESCR: "Cisco Pluggable Optics Module"
PID: GLC-SX-MMD        , VID: V01, SN: OPM221407E5

NAME: "0/RP0-PTP2", DESCR: "Cisco Pluggable Optics Module"
PID: SFP-GE-S          , VID: V01, SN: FNS17040APG

NAME: "0/RP0-PTP3", DESCR: "Cisco Pluggable Optics Module"
PID: ONS-SI-GE-LX      , VID: V02, SN: FNS19170MGZ

NAME: "0/0/NXR0", DESCR: "NCS 1010 Optical Line Terminal - C-band, enhanced"
PID: NCS1K-E-OLT-C     , VID: V01, SN: FCB2721B1DP

NAME: "0/9/NXR0", DESCR: "Network Convergence System 1014 Filler"
PID: NCS1K14-BLANK     , VID: V01, SN: N/A

NAME: "0/1/NXR0", DESCR: "Network Convergence System 1010 Passive Filler"
PID: NCS1010-FLR-P     , VID: V01, SN: N/A

NAME: "0/2/NXR0", DESCR: "NCS 1014 16 port Colorless Direct attach LC with EDFA C-band"
PID: NCS1K14-CCMD-16-C , VID: V01, SN: FCB2749B06U

NAME: "0/3/NXR0", DESCR: "NCS 1014 16 port Colorless Direct attach LC with EDFA C-band"
PID: NCS1K14-CCMD-16-C , VID: V00, SN: FCB2744B0FA

NAME: "0/4/NXR0", DESCR: "Network Convergence System 1014 Filler"
PID: NCS1K14-BLANK     , VID: V01, SN: N/A

NAME: "0/5/NXR0", DESCR: "Network Convergence System 1014 Filler"
```

```
PID: NCS1K14-BLANK     , VID: V01, SN: N/A

NAME: "0/6/NXR0", DESCR: "Network Convergence System 1014 Filler"
PID: NCS1K14-BLANK     , VID: V01, SN: N/A

NAME: "0/7/NXR0", DESCR: "Network Convergence System 1014 Filler"
PID: NCS1K14-BLANK     , VID: V01, SN: N/A

NAME: "0/8/NXR0", DESCR: "Network Convergence System 1014 Filler"
PID: NCS1K14-BLANK     , VID: V01, SN: N/A

NAME: "0/FT0", DESCR: "NCS1010 - Shelf Fan"
PID: NCS1010-FAN       , VID: V01, SN: FCB2719B0WP

NAME: "0/FT1", DESCR: "NCS1010 - Shelf Fan"
PID: NCS1010-FAN       , VID: V01, SN: FCB2720B2H2

NAME: "0/FT4", DESCR: "NCS 1020 FAN Tray"
PID: NCS1020-FAN       , VID: V00, SN: FCB2752B05V

NAME: "0/FT5", DESCR: "NCS 1020 FAN Tray"
PID: NCS1020-FAN       , VID: V00, SN: FCB2752B05W

NAME: "0/FT6", DESCR: "NCS 1020 FAN Tray"
PID: NCS1020-FAN       , VID: V00, SN: FCB2752B08C

NAME: "0/FT7", DESCR: "NCS 1020 FAN Tray"
PID: NCS1020-FAN       , VID: V00, SN: FCB2752B072

NAME: "0/PM0", DESCR: "Network Convergence System 1004 AC Power Supply Unit 2.5KW"
PID: NCS1K4-AC-PSU-2   , VID: V01, SN: POG27430N29
```

```
NAME: "0/PM1", DESCR: "Network Convergence System 1004 AC Power Supply Unit 2.5KW"

PID: NCS1K4-AC-PSU-2   , VID: V01, SN: POG27430N1P
```

Verify Software Version

NCS 1020 is shipped with the Cisco IOS XR software preinstalled. Verify that the latest version of the software is installed.

To verify the version of Cisco IOS XR Software running on NCS 1020, 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

Mon May  6 16:38:47.424 IST

Cisco IOS XR Software, Version 24.2.1.32I LNT

Copyright (c) 2013-2024 by Cisco Systems, Inc.


Build Information:

Built By     : cisco

Built On     : Thu Apr 11 02:06:44 UTC 2024

Build Host   : iox-ucs-033

Workspace    : /auto/iox-ucs-033-san1/prod/24.2.1.32I.SIT_IMAGE/ncs1010/ws/

Version      : 24.2.1.32I

Label        : 24.2.1.32I-MSFT_PILOT


cisco NCS1010 (C3758R @ 2.40GHz)

cisco NCS1020-SA (C3758R @ 2.40GHz) processor with 32GB of memory

NCS1020_P1B_DT_10 uptime is 4 days, 5 hours, 9 minutes

NCS 1020 Chassis
```

Verify Firmware Version

The firmware version on various hardware components of NCS 1020 must be compatible with the installed Cisco IOS XR release. Incompatibility may cause NCS 1020 to malfunction.

To verify the firmware version, perform the following procedure.

Procedure

Step 1 **show hw-module fpd**

Displays the firmware information of various hardware components of NCS 1020.

Example:

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

Mon May  6 16:39:04.587 IST


Auto-upgrade:Enabled

Attribute codes: B golden, P protect, S secure, A Anti Theft aware

                                                                          FPD Versions

                                                                          ==============

Location   Card type             HWver FPD device       ATR Status   Running Programd  Reload Loc

-------------------------------------------------------------------------------------------------

0/RP0/CPU0 NCS1010-CTR2-B-K9     0.1   ADMCONFIG            CURRENT    1.00    1.00       NOT REQ

0/RP0/CPU0 NCS1010-CTR2-B-K9     0.1   BIOS             S   CURRENT    5.20    5.20         0/RP0

0/RP0/CPU0 NCS1010-CTR2-B-K9     0.1   BIOS-Golden      BS  CURRENT            1.90         0/RP0

0/RP0/CPU0 NCS1010-CTR2-B-K9     0.1   CpuFpga          S   CURRENT    1.06    1.06         0/RP0

0/RP0/CPU0 NCS1010-CTR2-B-K9     0.1   CpuFpgaGolden    BS  CURRENT            1.02         0/RP0

0/RP0/CPU0 NCS1010-CTR2-B-K9     0.1   SsdMicron5300    S   CURRENT    0.01    0.01         0/RP0

0/RP0/CPU0 NCS1010-CTR2-B-K9     0.1   TamFw            S   CURRENT    9.07    9.07         0/RP0

0/RP0/CPU0 NCS1010-CTR2-B-K9     0.1   TamFwGolden      BS  CURRENT            9.06         0/RP0

0/PM0      NCS1K4-AC-PSU-2       1.0   PO-PriMCU            CURRENT    1.03    1.03       NOT REQ

0/PM0      NCS1K4-AC-PSU-2       1.0   PO-SecMCU            CURRENT    1.05    1.05       NOT REQ

0/PM1      NCS1K4-AC-PSU-2       1.0   PO-PriMCU            CURRENT    1.03    1.03       NOT REQ

0/PM1      NCS1K4-AC-PSU-2       1.0   PO-SecMCU            CURRENT    1.05    1.05       NOT REQ
```

```
0/0/NXR0   NCS1K-E-OLT-C         1.0   OLT              S   CURRENT    3.14    3.14        NOT REQ

0/2/NXR0   NCS1K14-CCMD-16-C     1.0   CpuModFw         S   CURRENT   42.15   42.15        NOT REQ

0/2/NXR0   NCS1K14-CCMD-16-C     1.0   OptModFw         S   CURRENT   20.02   20.02        NOT REQ

0/3/NXR0   NCS1K14-CCMD-16-C     1.0   CpuModFw         S   CURRENT   42.15   42.15        NOT REQ

0/3/NXR0   NCS1K14-CCMD-16-C     1.0   OptModFw         S   CURRENT   20.02   20.02        NOT REQ

0/Rack     NCS1020-SA            0.1   ADMCONFIG            CURRENT    1.00    1.00        NOT REQ

0/Rack     NCS1020-SA            0.1   IoFpgaLow        S   CURRENT    1.08    1.08        NOT REQ

0/Rack     NCS1020-SA            0.1   IoFpgaLowGolden  BS  CURRENT            0.07        NOT REQ

0/Rack     NCS1020-SA            0.1   IoFpgaUp         S   CURRENT    1.08    1.08        NOT REQ

0/Rack     NCS1020-SA            0.1   IoFpgaUpGolden   BS  CURRENT            0.06        NOT REQ

0/Rack     NCS1020-SA            0.1   SsdMicron5400    S   CURRENT    0.02    0.02         0/Rack
```

Step 2 **show fpd package**

Displays the FPD image version available with this software release for each hardware component.

Example:

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

================================ ============================================
                                        Field Programmable Device Package
                                 ============================================
                                           Req      SW       Min Req   Min Req
Card Type            FPD Description       Reload   Ver      SW Ver    Board Ver
================== ========================= ====== ======= ======== =========
--------------------------------------------------------------------------------
NCS1010-CTR2-B-K9    ADMCONFIG               NO      1.00      1.00      0.1
                     BIOS                    YES     5.20      5.20      0.0
                     BIOS-Golden             YES     5.10      0.01      0.0
                     CpuFpga                 YES     1.06      1.06      0.0
                     CpuFpgaGolden           YES     1.02      0.01      0.0
                     SsdIntelS4510           YES    11.32     11.32      0.0
                     SsdMicron5300           YES     0.01      0.01      0.0
                     SsdMicron5400           YES     0.02      0.02      0.0
                     TamFw                   YES     9.07      9.07      0.0
                     TamFwGolden             YES     9.06      0.01      0.0
--------------------------------------------------------------------------------
NCS1010-CTR2-K9      ADMCONFIG               NO      1.00      1.00      0.1
                     BIOS                    YES     5.20      5.20      0.0
                     BIOS-Golden             YES     5.10      0.01      0.0
                     CpuFpga                 YES     1.06      1.06      0.0
                     CpuFpgaGolden           YES     1.02      0.01      0.0
                     SsdIntelS4510           YES    11.32     11.32      0.0
                     SsdMicron5300           YES     0.01      0.01      0.0
                     SsdMicron5400           YES     0.02      0.02      0.0
                     TamFw                   YES     9.07      9.07      0.0
                     TamFwGolden             YES     9.06      0.01      0.0
--------------------------------------------------------------------------------
NCS1020-SA           ADMCONFIG               NO      1.00      1.00      0.0
                     IoFpgaLow               NO      1.08      1.08      0.0
                     IoFpgaLowGolden         NO      0.07      0.01      0.0
                     IoFpgaUp                NO      1.08      1.08      0.0
                     IoFpgaUpGolden          NO      0.06      0.01      0.0
```

```
                    SsdIntelSC2KB             YES     1.20      1.20      0.0
                    SsdMicron5400             YES     0.02      0.02      0.0
-------------------------------------------------------------------------------
NCS1K-E-ILA-2R-C    ILA                       NO      3.14      3.14      0.1
                    ILA                       NO      0.28      0.28     99.1
                    Raman-1                   NO      3.14      3.14      0.1
                    Raman-1                   NO      0.28      0.28     99.1
                    Raman-2                   NO      3.14      3.14      0.1
                    Raman-2                   NO      0.28      0.28     99.1
-------------------------------------------------------------------------------
NCS1K-E-ILA-R-C     ILA                       NO      3.14      3.14      0.1
                    ILA                       NO      0.28      0.28     99.1
                    Raman-1                   NO      3.14      3.14      0.1
                    Raman-1                   NO      0.28      0.28     99.1
-------------------------------------------------------------------------------
NCS1K-E-ILA-R-C-2   ILA                       NO      3.14      3.14      0.1
                    ILA                       NO      0.28      0.28     99.1
                    Raman-2                   NO      3.14      3.14      0.1
                    Raman-2                   NO      0.28      0.28     99.1
-------------------------------------------------------------------------------
NCS1K-E-OLT-C       OLT                       NO      3.14      3.14      0.1
                    OLT                       NO      0.28      0.28     99.1
-------------------------------------------------------------------------------
NCS1K-E-OLT-L       OLT                       NO      3.12      3.12      0.1
-------------------------------------------------------------------------------
NCS1K-E-OLT-R-C     OLT                       NO      3.14      3.14      0.1
                    OLT                       NO      0.28      0.28     99.1
                    Raman-1                   NO      3.14      3.14      0.1
                    Raman-1                   NO      0.28      0.28     99.1
-------------------------------------------------------------------------------
NCS1K-ILA-2R-C      ILA                       NO      3.14      3.14      0.1
                    ILA                       NO      0.28      0.28     99.1
                    Raman-1                   NO      3.14      3.14      0.1
                    Raman-1                   NO      0.28      0.28     99.1
                    Raman-2                   NO      3.14      3.14      0.1
                    Raman-2                   NO      0.28      0.28     99.1
-------------------------------------------------------------------------------
NCS1K-ILA-C         ILA                       NO      3.14      3.14      0.1
                    ILA                       NO      0.28      0.28     99.1
-------------------------------------------------------------------------------
NCS1K-ILA-L         ILA                       NO      3.12      3.12      0.1
-------------------------------------------------------------------------------
NCS1K-ILA-R-C       ILA                       NO      3.14      3.14      0.1
                    ILA                       NO      0.28      0.28     99.1
                    Raman-1                   NO      3.14      3.14      0.1
                    Raman-1                   NO      0.28      0.28     99.1
-------------------------------------------------------------------------------
NCS1K-OLT-C         OLT                       NO      3.14      3.14      0.1
                    OLT                       NO      0.28      0.28     99.1
-------------------------------------------------------------------------------
NCS1K-OLT-L         OLT                       NO      3.12      3.12      0.1
-------------------------------------------------------------------------------
NCS1K-OLT-R-C       OLT                       NO      3.14      3.14      0.1
                    OLT                       NO      0.28      0.28     99.1
                    Raman-1                   NO      3.14      3.14      0.1
                    Raman-1                   NO      0.28      0.28     99.1
-------------------------------------------------------------------------------
NCS1K14-CCMD-16-C   CpuModFw                  NO     42.14     42.14      0.0
                    OptModFw                  NO     20.02     20.02      0.0
-------------------------------------------------------------------------------
NCS1K14-CCMD-16-L   CpuModFw                  NO     42.14     42.14      0.0
                    OptModFw                  NO     20.02     20.02      0.0
-------------------------------------------------------------------------------
```

```
NCS1K4-AC-PSU-2      PO-PriMCU                NO      1.03      1.03      0.1
                     PO-SecMCU                NO      1.05      1.05      0.1
```

Verify Management Interface Status

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

Procedure

Step 1 **show interfaces MgmtEth 0/RP0/CPU0/0**

Displays the management interface configuration.

Example:

```
RP/0/RP0/CPU0:ios#show interfaces MgmtEth 0/RP0/CPU0/0
Wed May 25 11:49:18.118 UTC
MgmtEth0/RP0/CPU0/0 is up, line protocol is up
  Interface state transitions: 1
  Hardware is Management Ethernet, address is 38fd.f866.0964 (bia 38fd.f866.0964)
  Internet address is 10.33.0.61/16
  MTU 1514 bytes, BW 1000000 Kbit (Max: 1000000 Kbit)
     reliability 255/255, txload 0/255, rxload 0/255
  Encapsulation ARPA,
  Full-duplex, 1000Mb/s, CX, link type is autonegotiation
  loopback not set,
  Last link flapped 15:05:21
  ARP type ARPA, ARP timeout 04:00:00
  Last input never, output 00:00:00
  Last clearing of "show interface" counters never
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
     53138 packets input, 6636701 bytes, 0 total input drops
     0 drops for unrecognized upper-level protocol
     Received 12145 broadcast packets, 40082 multicast packets
              0 runts, 0 giants, 0 throttles, 0 parity
     0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
     217288 packets output, 60964220 bytes, 0 total output drops
     Output 1 broadcast packets, 15 multicast packets
     0 output errors, 0 underruns, 0 applique, 0 resets
     0 output buffer failures, 0 output buffers swapped out
     1 carrier transitions
```

Step 2 **show interfaces summary** and **show interfaces brief**

Verifies the management interface status.

Example:

```
RP/0/RP0/CPU0:ios#show interfaces summary
Wed May 25 11:50:02.558 UTC
Interface Type          Total     UP       Down     Admin Down
--------------          -----     --       ----     ----------
ALL TYPES                9         5         0          4
--------------
IFT_GETHERNET           1         1          0          0
IFT_LOOPBACK            2         2          0          0
```

```
IFT_ETHERNET            3        1          0          2
IFT_NULL                1        1          0          0
IFT_PTP_ETHERNET        2        0          0          2
```

Example:

```
RP/0/RP0/CPU0:ios#show interfaces brief
Wed May 25 11:50:28.438 UTC

               Intf     Intf        LineP              Encap         MTU        BW
               Name    State       State               Type        (byte)    (Kbps)
--------------------------------------------------------------------------------------------

                Lo0       up          up              Loopback       1500          0
                Lo3       up          up              Loopback       1500          0
                Nu0       up          up               Null           1500          0
          Gi0/0/0/0       up          up               ARPA           1514    1000000
        Mg0/RP0/CPU0/0     up          up               ARPA           1514    1000000
       Mg0/RP0/CPU0/1    admin-down  admin-down        ARPA  1514     1000000
       Mg0/RP0/CPU0/2    admin-down  admin-down        ARPA  1514     1000000
       PT0/RP0/CPU0/0    admin-down  admin-down        ARPA  1514     1000000
       PT0/RP0/CPU0/1    admin-down  admin-down        ARPA  1514     1000000
```

Example:

```
RP/0/RP0/CPU0:ios#show ipv4 interfaces brief
Tue Jul 12 07:32:42.390 UTC

Interface                      IP-Address      Status          Protocol Vrf-Name
Loopback0                      10.3.3.21        Up              Up       default
Loopback3                      10.1.1.2        Up              Up       default
GigabitEthernet0/0/0/0         10.7.1.20        Up              Up       default
MgmtEth0/RP0/CPU0/0            10.4.33.63       Up              Up       default
PTP0/RP0/CPU0/0                unassigned      Shutdown        Down     default
MgmtEth0/RP0/CPU0/1            unassigned      Down            Down     default
PTP0/RP0/CPU0/1                unassigned      Shutdown        Down     default
MgmtEth0/RP0/CPU0/2            unassigned      Down            Down     default
```

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 system active

Thu Apr 28 06:16:50.524 UTC
```

```
------------------------------------------------------------------------------------
Active Alarms
------------------------------------------------------------------------------------
Location        Severity     Group            Set Time                  Description
------------------------------------------------------------------------------------
0/RP0/CPU0      Major        Ethernet         04/28/2022 06:03:39 UTC   RP-SW: SPI flash config is incorrect
0/PM0           Major        Environ          04/28/2022 06:03:50 UTC   Power Module Error (PM_VIN_VOLT_OOR)
0/PM0           Major        Environ          04/28/2022 06:03:50 UTC   Power Module Output Disabled
(PM_OUTPUT_DISABLED)
0               Major        Environ          04/28/2022 06:03:50 UTC   Power Group redundancy lost
0/PM0           Major        FPD_Infra        04/28/2022 06:04:08 UTC   One Or More FPDs Need Upgrade Or Not In
Current State
0/PM1           Major        FPD_Infra        04/28/2022 06:04:09 UTC   One Or More FPDs Need Upgrade Or Not In
Current State
0/0             Minor        Environ          04/28/2022 06:04:10 UTC   ILAC_CT_1: Invalid sensor read error.
0/0             Minor        Environ          04/28/2022 06:04:10 UTC   ILAC_CT_2: Invalid sensor read error.
0/0             Minor        Environ          04/28/2022 06:04:10 UTC   ILAC_CT_3: Invalid sensor read error.
0/0             Minor        Environ          04/28/2022 06:04:10 UTC   ILAC_CT_4: Invalid sensor read error.
0/0             Major        Controller       04/28/2022 06:05:12 UTC   Osc0/0/0/0 - Provisioning Failed
0/0             Major        Controller       04/28/2022 06:05:12 UTC   Osc0/0/0/2 - Provisioning Failed
0/0             Major        Controller       04/28/2022 06:05:12 UTC   Ots0/0/0/0 - Provisioning Failed
0/0             Major        Controller       04/28/2022 06:05:12 UTC   Ots0/0/0/2 - Provisioning Failed
```

Note
In the maintenance mode, all the alarms are moved from active to suppressed and the **show alarms** command does not display the alarms details.

Verify Environmental Parameters

The **show environment** command displays the environmental parameters of NCS 1020.

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

Procedure

show environment [**all** | **current** | **fan** | **power** | **voltages** [**location** | *location*] | **temperature** [**location** | *location*]]

Displays the environmental parameters of NCS 1020.

Example:

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

```
RP/0/RP0/CPU0:ios#show environment fan

Mon Apr 29 11:34:01.781 IST

============================================================================

                                          Fan speed (rpm)

Location      FRU Type                    FAN_0    FAN_1   FAN_2

----------------------------------------------------------------------------
```

```
0/FT0        NCS1010-FAN                    7860    7860    7860

0/FT1        NCS1010-FAN                    7800    7740    7740

0/FT4        NCS1020-FAN                    7740    7740

0/FT5        NCS1020-FAN                    7740    7740

0/FT6        NCS1020-FAN                    3960    3960

0/FT7        NCS1020-FAN                    4020    3960

0/PM0        NCS1K4-AC-PSU-2                5632    5504

0/PM1        NCS1K4-AC-PSU-2                5536    5568
```

The following example shows a sample output of the **show environment** command with the **temperatures** keyword for *0/RP0 location*.

```
RP/0/RP0/CPU0:ios#show environment temperature location 0/RP0

Mon Apr 29 11:41:39.134 IST

==============================================================================================================

Location  TEMPERATURE                          Value     Crit    Major    Minor    Minor    Major
  Crit

          Sensor                             (deg C)     (Lo)     (Lo)     (Lo)     (Hi)     (Hi)
  (Hi)

--------------------------------------------------------------------------------------------------------------

0/RP0/CPU0

          RP_TEMP_PCB                          22      -10       -5        0       80       85
    90

          RP_TEMP_HOT_SPOT                     26      -10       -5        0       80       85
    90

          RP_TEMP_LTM4638_0                    41      -10       -5        0       85       90
    95

          RP_TEMP_LTM4644_0                    29      -10       -5        0       85       90
    95

          RP_TEMP_LTM4644_1                    32      -10       -5        0       85       90
    95

          TEMP_CPU_DIE                         29      -10       -5        0       80       85
    90

          TEMP_DDR_DIMM                        25      -10       -5        0       80       85
    90

          TEMP_CPU_SSD                         28      -10       -5        0       70       75
    80

          TEMP_CHASSIS_SSD                     24      -10       -5        0       70       75
    80
```

The following example shows a sample output of the **show environment** command with the **temperatures** keyword for *0/0/NXR0 location*.

```
RP/0/RP0/CPU0:ios#show environment temperature location 0/0/NXR0

Mon Apr 29 11:41:39.134 IST

==============================================================================================================

Location  TEMPERATURE                          Value      Crit     Major    Minor    Minor    Major
  Crit

          Sensor                             (deg C)      (Lo)     (Lo)     (Lo)     (Hi)     (Hi)
  (Hi)

--------------------------------------------------------------------------------------------------------------

0/0/NXR0

          OLTC_LT_P0_iEDFA0                    25       17       18       19       31       32
    33

          OLTC_LT_P0_iEDFA1                    25       17       18       19       31       32
    33

          OLTC_LT_P0_iEDFA2                    25       17       18       19       31       32
    33

          OLTC_LT_P2_iEDFA0                    25       17       18       19       31       32
    33

          OLTC_LT_P3_iEDFA0                    25       17       18       19       31       32
    33

          OLTC_LT_P0_eEDFA0                    24       17       18       19       31       32
    33

          OLTC_CT_1                            23      -11       -8       -6       76       78
    81

          OLTC_LT_P0_eEDFA1                    24       17       18       19       31       32
    33

          OLTC_CT_2                            20      -11       -8       -6       71       74
    76

          OLTC_CT_3                            22      -11       -8       -6       71       74
    76

          OLTC_CT_4                            23      -11       -8       -6       71       74
    76

          OLTC_FT_P0_iEDFA0                    59       54       56       57       63       65
    66

          OLTC_FT_P2_iEDFA0                    59       54       56       57       63       65
    66

          OLTC_FT_P3_iEDFA0                    59       54       56       57       63       65
    66

          OLTC_FT_P0_eEDFA0                    59       54       56       57       63       65
    66
```

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

```
RP/0/RP0/CPU0:ios#show environment power

Mon Apr 29 11:36:36.442 IST

================================================================================

CHASSIS LEVEL POWER INFO: 0

================================================================================

   Total output power capacity (Group 0 + Group 1) :    2500W +     2500W

   Total output power required                     :    1189W

   Total power input                               :     278W

   Total power output                              :     204W


Power Group 0:

================================================================================

   Power       Supply         ------Input----   ------Output---     Status

   Module      Type            Volts     Amps    Volts     Amps

================================================================================

   0/PM0       NCS1K4-AC-PSU-2 232.0     0.6     12.1      9.5      OK


Total of Group 0:              139W/0.6A         114W/9.5A


Power Group 1:

================================================================================

   Power       Supply         ------Input----   ------Output---     Status

   Module      Type            Volts     Amps    Volts     Amps

================================================================================

   0/PM1       NCS1K4-AC-PSU-2 231.8     0.6     12.1      7.5      OK


Total of Group 1:              139W/0.6A         90W/7.5A


================================================================================

   Location     Card Type               Power       Power        Status

                                        Allocated   Used
```

```
                                        Watts       Watts
==============================================================================
   0/RP0/CPU0   NCS1010-CTR2-B-K9       70          16          ON
   0/FT0        NCS1010-FAN             110         9           ON
   0/FT1        NCS1010-FAN             110         9           ON
   0/FT2        -                       110         0           RESERVED
   0/FT3        -                       110         0           RESERVED
   0/FT4        NCS1020-FAN             73          6           ON
   0/FT5        NCS1020-FAN             73          6           ON
   0/FT6        NCS1020-FAN             73          3           ON
   0/FT7        NCS1020-FAN             73          1           ON
   0/0/NXR0     NCS1K-E-OLT-C           142         73          ON
   0/2/NXR0     NCS1K14-CCMD-16-C       100         17          ON
   0/3/NXR0     NCS1K14-CCMD-16-C       100         21          ON
   0/Rack       NCS1020-SA              45          18          ON
```

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

```
RP/0/RP0/CPU0:ios#show environment voltage location 0/RP0

Mon Apr 29 11:40:53.949 IST

================================================================================================================
Location  VOLTAGE                              Value      Crit    Minor    Minor     Crit
          Sensor                               (mV)       (Lo)    (Lo)     (Hi)      (Hi)
----------------------------------------------------------------------------------------------------------------

0/RP0/CPU0
          RP_ADM1266_12V0                     12035    10800    11280    12720    13200
          RP_ADM1266_3V3_STANDBY               3314     3070     3200     3400     3530
          RP_ADM1266_5V0                       4993     4650     4850     5150     5350
          RP_ADM1266_3V3                       3325     3070     3200     3400     3530
          RP_ADM1266_2V5_PLL                   2522     2330     2430     2580     2680
          RP_ADM1266_2V5_FPGA                  2494     2330     2430     2580     2680
          RP_ADM1266_1V2_FPGA                  1204     1120     1160     1240     1280
          RP_ADM1266_3V3_CPU                   3336     3070     3200     3400     3530
          RP_ADM1266_2V5_CPU                   2509     2330     2430     2580     2680
          RP_ADM1266_1V8_CPU                   1803     1670     1750     1850     1930
```

```
          RP_ADM1266_1V24_VCCREF              1238     1150     1200     1280     1330
          RP_ADM1266_1V05_CPU                 1050      980     1020     1080     1120
          RP_ADM1266_1V2_DDR_VDDQ             1199     1120     1160     1240     1280
          RP_ADM1266_1V0_VCC_RAM              1106      650      700     1250     1300
          RP_ADM1266_1V0_VNN                   918      550      600     1250     1300
          RP_ADM1266_1V0_VCCP                 1153      450      500     1250     1300
          RP_ADM1266_0V6_DDR_VTT               602      560      580      620      640
```

The following example shows a sample output of the **show environment** command with the **current** keyword.

```
RP/0/RP0/CPU0:ios#show environment current
Mon Apr 29 11:33:28.410 IST
=============================================================================================================
Location  CURRENT                             Value
          Sensor                              (mA)
-------------------------------------------------------------------------------------------------------------
0/RP0/CPU0
          RP_CURRMON_LTM4638_0                 387
          RP_CURRMON_LTM4644_0                 171
          RP_CURRMON_LTM4644_1                 320
          RP_JMAC_1V0_VCCP_IMON                125
          RP_JMAC_1V0_VNN_IMON                 125
          RP_JMAC_1V0_VCC_RAM_IMON               0
          RP_JMAC_1V2_DDR_VDDQ_IMON            156
0/2/NXR0
          IMON_OPTM                           1167
          IMON_CTLPL                           521
0/3/NXR0
          IMON_OPTM                           1242
          IMON_CTLPL                           525
0/Rack
          SA_U_INA230_3V3_IMON                2740
          SA_U_INA230_1V0_XGE_CORE_IMON       3295
          SA_U_INA230_1V0_POLLUX10_CORE        979
```

```
SA_U_ADM1275_12V_EITU_IMON           1528
SA_U_ADM1275_12V_CPU0_IMON           1398
SA_U_ADM1275_12V_MOD0_IMON           5886
SA_U_ADM1275_12V_MOD1_IMON             18
SA_U_ADM1275_12V_MOD2_IMON             18
SA_U_ADM1275_12V_LC2_IMON            1629
SA_U_ADM1275_12V_LC3_IMON            1716
SA_U_ADM1275_12V_LC4_IMON               6
SA_U_ADM1275_12V_LC5_IMON              18
SA_L_INA230_1V0_PROPUS10_CORE         942
SA_L_INA230_5V_USB_IMON_A              99
SA_L_INA230_5V_USB_IMON_B              97
SA_L_ADM1275_12V_CPU1_IMON             13
SA_L_ADM1275_12V_MOD3_IMON             51
SA_L_ADM1275_12V_MOD4_IMON             18
SA_L_ADM1275_12V_MOD5_IMON             18
SA_L_ADM1275_12V_FAN0_IMON            799
SA_L_ADM1275_12V_FAN1_IMON            762
SA_L_ADM1275_12V_FAN2_IMON             43
SA_L_ADM1275_12V_FAN3_IMON             18
SA_L_ADM1275_12V_LC6_IMON               6
SA_L_ADM1275_12V_LC7_IMON              30
SA_L_ADM1275_12V_LC8_IMON               6
SA_L_ADM1275_12V_LC9_IMON              30
SA_L_ADM1275_12V_FAN4_0_IMON          294
SA_L_ADM1275_12V_FAN4_1_IMON          288
SA_L_ADM1275_12V_FAN5_0_IMON          319
SA_L_ADM1275_12V_FAN5_1_IMON          362
SA_L_ADM1275_12V_FAN6_0_IMON           96
SA_L_ADM1275_12V_FAN6_1_IMON          114
SA_L_ADM1275_12V_FAN7_0_IMON          145
SA_L_ADM1275_12V_FAN7_1_IMON          127
```

The following example shows a sample output of the **show environment** command with the **all** keyword.

```
RP/0/RP0/CPU0:ios#show environment all

Mon Apr 29 11:32:46.987 IST

================================================================================================================

Location  TEMPERATURE                          Value     Crit    Major    Minor    Minor    Major
  Crit
          Sensor                             (deg C)     (Lo)     (Lo)     (Lo)     (Hi)     (Hi)
  (Hi)
----------------------------------------------------------------------------------------------------------------

0/RP0/CPU0
          RP_TEMP_PCB                          22      -10       -5        0       80       85
    90
          RP_TEMP_HOT_SPOT                     27      -10       -5        0       80       85
    90
          RP_TEMP_LTM4638_0                    42      -10       -5        0       85       90
    95
          RP_TEMP_LTM4644_0                    30      -10       -5        0       85       90
    95
          RP_TEMP_LTM4644_1                    32      -10       -5        0       85       90
    95
          TEMP_CPU_DIE                         29      -10       -5        0       80       85
    90
          TEMP_DDR_DIMM                        25      -10       -5        0       80       85
    90
          TEMP_CPU_SSD                         29      -10       -5        0       70       75
    80
          TEMP_CHASSIS_SSD                     24      -10       -5        0       70       75
    80

0/0/NXR0
          OLTC_LT_P0_iEDFA0                    25       17       18       19       31       32
    33
          OLTC_LT_P0_iEDFA1                    25       17       18       19       31       32
    33
          OLTC_LT_P0_iEDFA2                    25       17       18       19       31       32
    33
          OLTC_LT_P2_iEDFA0                    25       17       18       19       31       32
    33
          OLTC_LT_P3_iEDFA0                    25       17       18       19       31       32
    33
          OLTC_LT_P0_eEDFA0                    24       17       18       19       31       32
    33
```

```
        OLTC_CT_1                       23      -11     -8      -6      76      78
    81
        OLTC_LT_P0_eEDFA1               24       17     18      19      31      32
    33
        OLTC_CT_2                       20      -11     -8      -6      71      74
    76
        OLTC_CT_3                       23      -11     -8      -6      71      74
    76
        OLTC_CT_4                       23      -11     -8      -6      71      74
    76
        OLTC_FT_P0_iEDFA0               59       54     56      57      63      65
    66
        OLTC_FT_P2_iEDFA0               60       54     56      57      63      65
    66
        OLTC_FT_P3_iEDFA0               60       54     56      57      63      65
    66
        OLTC_FT_P0_eEDFA0               59       54     56      57      63      65
    66
0/2/NXR0
        TEMP_DX_PCB                     24      -10     -5       0      95      100
   105
        TEMP_DX_ZYNQ                    27      -10     -5       0      95      100
   105
0/3/NXR0
        TEMP_DX_PCB                     23      -10     -5       0      95      100
   105
        TEMP_DX_ZYNQ                    27      -10     -5       0      95      100
   105
0/PM0
        Air Inlet Temperature           22      -10     -5       0      62      67
    72
        Air Outlet Temperature          24      -10     -5       0      82      87
    92
        Oring MOSFET                    29      -10     -5       0      77      82
    87
0/PM1
        Air Inlet Temperature           24      -10     -5       0      62      67
    72
        Air Outlet Temperature          25      -10     -5       0      82      87
    92
        Oring MOSFET                    30      -10     -5       0      77      82
```

```
    87

0/Rack

          SA_U_TMP421_EITU_PCB_HOTSPOT0          28      -10       -5        0       80       85
    90

          SA_U_TMP421_EITU_PCB_HOTSPOT1          37      -10       -5        0       80       85
    90

          SA_U_TMP421_EITU_PCB_HOTSPOT2          30      -10       -5        0       80       85
    90

          SA_U_TMP421_EITU_PCB_HOTSPOT3          34      -10       -5        0       80       85
    90

          SA_L_TMP421_CHASSIS_INLET0             20      -10       -5        0       45       55
    60

          SA_L_TMP421_CHASSIS_EXHAUST0           22      -10       -5        0       75       85
    90

          SA_L_TMP421_CHASSIS_EXHAUST1           24      -10       -5        0       75       85
    90

          SA_L_TMP421_CHASSIS_EXHAUST2           22      -10       -5        0       75       85
    90

          SA_L_TMP421_CHASSIS_EXHAUST3           21      -10       -5        0       75       85
    90

          SA_L_TMP421_CHASSIS_EXHAUST4           23      -10       -5        0       75       85
    90

          SA_L_TMP421_CHASSIS_EXHAUST5           22      -10       -5        0       75       85
    90

==============================================================================================================

Location  VOLTAGE                                Value      Crit    Minor    Minor     Crit

          Sensor                                 (mV)       (Lo)    (Lo)     (Hi)      (Hi)

--------------------------------------------------------------------------------------------------------------

0/RP0/CPU0

          RP_ADM1266_12V0                       12035    10800    11280    12720    13200

          RP_ADM1266_3V3_STANDBY                 3314     3070     3200     3400     3530

          RP_ADM1266_5V0                         4993     4650     4850     5150     5350

          RP_ADM1266_3V3                         3325     3070     3200     3400     3530

          RP_ADM1266_2V5_PLL                     2522     2330     2430     2580     2680

          RP_ADM1266_2V5_FPGA                    2494     2330     2430     2580     2680

          RP_ADM1266_1V2_FPGA                    1204     1120     1160     1240     1280

          RP_ADM1266_3V3_CPU                     3336     3070     3200     3400     3530

          RP_ADM1266_2V5_CPU                     2509     2330     2430     2580     2680
```

	RP_ADM1266_1V8_CPU	1803	1670	1750	1850	1930
	RP_ADM1266_1V24_VCCREF	1238	1150	1200	1280	1330
	RP_ADM1266_1V05_CPU	1050	980	1020	1080	1120
	RP_ADM1266_1V2_DDR_VDDQ	1199	1120	1160	1240	1280
	RP_ADM1266_1V0_VCC_RAM	1103	650	700	1250	1300
	RP_ADM1266_1V0_VNN	918	550	600	1250	1300
	RP_ADM1266_1V0_VCCP	1154	450	500	1250	1300
	RP_ADM1266_0V6_DDR_VTT	598	560	580	620	640
0/2/NXR0						
	VIN_5_0V	5023	4500	4750	5250	5500
	VAUX_3_3V_ST	3317	3053	3135	3465	3548
	VIN_12_0V	12066	10800	11400	12600	13200
	VMON_3_3V	3298	3135	3201	3399	3465
	VMON_1_8V_MGT	1796	1710	1746	1854	1890
	VMON_1_8V	1799	1710	1746	1854	1890
	VMON_1_2V	1200	1140	1164	1236	1260
	VMON_2_5V	2489	2357	2425	2575	2625
	VMON_0_85V_MGT	852	808	825	876	893
	VMON_0_85V	849	808	825	876	893
0/3/NXR0						
	VIN_5_0V	5003	4500	4750	5250	5500
	VAUX_3_3V_ST	3313	3053	3135	3465	3548
	VIN_12_0V	12051	10800	11400	12600	13200
	VMON_3_3V	3292	3135	3201	3399	3465
	VMON_1_8V_MGT	1799	1710	1746	1854	1890
	VMON_1_8V	1796	1710	1746	1854	1890
	VMON_1_2V	1202	1140	1164	1236	1260
	VMON_2_5V	2500	2357	2425	2575	2625
	VMON_0_85V_MGT	853	808	825	876	893
	VMON_0_85V	849	808	825	876	893
0/Rack						
	SA_U_ADM1266_12V_BUS_EITU	12042	10800	11280	12720	13200

SA_U_ADM1266_2V5	2498	2325	2400	2600	2675
SA_U_ADM1266_3V3	3308	3069	3168	3432	3531
SA_U_ADM1266_3V3_STANDBY	3297	3069	3168	3432	3531
SA_U_ADM1266_1V2_PROPUS10_FPGA	1203	1116	1152	1248	1284
SA_U_ADM1266_1V0_PROPUS10_FPGA	1008	930	960	1040	1070
SA_U_ADM1266_5V0_USB_A	5085	4650	4800	5200	5350
SA_U_ADM1266_5V0_USB_B	5070	4650	4800	5200	5350
SA_U_ADM1275_12V_EITU	12048	10800	11280	12720	13200
SA_U_ADM1275_12V_CPU0	12027	10800	11280	12720	13200
SA_U_ADM1275_12V_MOD0	12048	10800	11280	12720	13200
SA_U_ADM1266_5V0	4998	4650	4800	5200	5350
SA_U_ADM1275_12V_MOD1	-	10800	11280	12720	13200
SA_U_ADM1275_12V_MOD2	-	10800	11280	12720	13200
SA_U_ADM1275_12V_LC2	12042	10800	11280	12720	13200
SA_U_ADM1275_12V_LC3	12037	10800	11280	12720	13200
SA_U_ADM1275_12V_LC4	-	10800	11280	12720	13200
SA_U_ADM1275_12V_LC5	-	10800	11280	12720	13200
SA_U_ADM1266_1V8_ZARLINK_DPLL	1799	1674	1728	1872	1926
SA_U_ADM1266_1V0_PHY	1009	930	960	1040	1070
SA_L_ADM1275_12V_CPU1	-	10800	11280	12720	13200
SA_L_ADM1275_12V_MOD3	-	10800	11280	12720	13200
SA_L_ADM1275_12V_MOD4	-	10800	11280	12720	13200
SA_L_ADM1275_12V_MOD5	-	10800	11280	12720	13200
SA_L_ADM1275_12V_FAN0	12027	10800	11280	12720	13200
SA_L_ADM1275_12V_FAN1	12032	10800	11280	12720	13200
SA_L_ADM1275_12V_FAN2	-	10800	11280	12720	13200
SA_L_ADM1275_12V_FAN3	-	10800	11280	12720	13200
SA_U_ADM1266_1V0_ALDRIN_CORE	983	910	930	1070	1090
SA_L_ADM1275_12V_LC6	-	10800	11280	12720	13200
SA_L_ADM1275_12V_LC7	-	10800	11280	12720	13200
SA_L_ADM1275_12V_LC8	-	10800	11280	12720	13200
SA_L_ADM1275_12V_LC9	-	10800	11280	12720	13200

```
          SA_L_ADM1275_12V_FAN4_0            12027    10800    11280    12720    13200
          SA_L_ADM1275_12V_FAN4_1            12037    10800    11280    12720    13200
          SA_L_ADM1275_12V_FAN5_0            12058    10800    11280    12720    13200
          SA_L_ADM1275_12V_FAN5_1            12017    10800    11280    12720    13200
          SA_L_ADM1275_12V_FAN6_0            12058    10800    11280    12720    13200
          SA_L_ADM1275_12V_FAN6_1            12037    10800    11280    12720    13200
          SA_U_ADM1266_1V0_ALDRIN_SERDES      1008      930      960     1040     1070
          SA_L_ADM1275_12V_FAN7_0            12032    10800    11280    12720    13200
          SA_L_ADM1275_12V_FAN7_1            12058    10800    11280    12720    13200
          SA_U_ADM1266_1V0_POLLUX10_FPGA      1006      930      960     1040     1070
          SA_U_ADM1266_1V2_POLLUX10_FPGA      1203     1116     1152     1248     1284
          SA_U_ADM1266_1V8                    1806     1674     1728     1872     1926
==============================================================================================================

Location  CURRENT                            Value
          Sensor                             (mA)
--------------------------------------------------------------------------------------------------------------

0/RP0/CPU0
          RP_CURRMON_LTM4638_0                387
          RP_CURRMON_LTM4644_0                171
          RP_CURRMON_LTM4644_1                320
          RP_JMAC_1V0_VCCP_IMON               187
          RP_JMAC_1V0_VNN_IMON                125
          RP_JMAC_1V0_VCC_RAM_IMON              0
          RP_JMAC_1V2_DDR_VDDQ_IMON           156
0/2/NXR0
          IMON_OPTM                          1209
          IMON_CTLPL                          521
0/3/NXR0
          IMON_OPTM                          1234
          IMON_CTLPL                          525
0/Rack
          SA_U_INA230_3V3_IMON               2680
```

```
SA_U_INA230_1V0_XGE_CORE_IMON        3295
SA_U_INA230_1V0_POLLUX10_CORE         979
SA_U_ADM1275_12V_EITU_IMON           1528
SA_U_ADM1275_12V_CPU0_IMON           1417
SA_U_ADM1275_12V_MOD0_IMON           6773
SA_U_ADM1275_12V_MOD1_IMON             43
SA_U_ADM1275_12V_MOD2_IMON             55
SA_U_ADM1275_12V_LC2_IMON            1666
SA_U_ADM1275_12V_LC3_IMON            1679
SA_U_ADM1275_12V_LC4_IMON              43
SA_U_ADM1275_12V_LC5_IMON              43
SA_L_INA230_1V0_PROPUS10_CORE         942
SA_L_INA230_5V_USB_IMON_A              99
SA_L_INA230_5V_USB_IMON_B              97
SA_L_ADM1275_12V_CPU1_IMON             13
SA_L_ADM1275_12V_MOD3_IMON            113
SA_L_ADM1275_12V_MOD4_IMON             30
SA_L_ADM1275_12V_MOD5_IMON             18
SA_L_ADM1275_12V_FAN0_IMON            836
SA_L_ADM1275_12V_FAN1_IMON            836
SA_L_ADM1275_12V_FAN2_IMON             43
SA_L_ADM1275_12V_FAN3_IMON             55
SA_L_ADM1275_12V_LC6_IMON              43
SA_L_ADM1275_12V_LC7_IMON              18
SA_L_ADM1275_12V_LC8_IMON               6
SA_L_ADM1275_12V_LC9_IMON              80
SA_L_ADM1275_12V_FAN4_0_IMON          281
SA_L_ADM1275_12V_FAN4_1_IMON          281
SA_L_ADM1275_12V_FAN5_0_IMON          263
SA_L_ADM1275_12V_FAN5_1_IMON          331
SA_L_ADM1275_12V_FAN6_0_IMON          114
SA_L_ADM1275_12V_FAN6_1_IMON          114
```

```
          SA_L_ADM1275_12V_FAN7_0_IMON          120
          SA_L_ADM1275_12V_FAN7_1_IMON           52
==============================================================================
                                              Fan speed (rpm)
Location      FRU Type                        FAN_0    FAN_1   FAN_2
------------------------------------------------------------------------------

0/FT0         NCS1010-FAN                      7860    7920    7860
0/FT1         NCS1010-FAN                      7800    7740    7800
0/FT4         NCS1020-FAN                      7800    7740
0/FT5         NCS1020-FAN                      7800    7740
0/FT6         NCS1020-FAN                      3960    3960
0/FT7         NCS1020-FAN                      4020    3960
0/PM0         NCS1K4-AC-PSU-2                  5504    5504
0/PM1         NCS1K4-AC-PSU-2                  5536    5600
==============================================================================
Location     Altitude Value (Meters)    Source
------------------------------------------------------------------------------
0                   0                    config

==============================================================================
CHASSIS LEVEL POWER INFO: 0
==============================================================================
   Total output power capacity (Group 0 + Group 1) :    2500W +     2500W
   Total output power required                     :    1189W
   Total power input                               :     278W
   Total power output                              :     206W

Power Group 0:
==============================================================================
   Power       Supply         ------Input----   ------Output---     Status
   Module      Type            Volts     Amps    Volts     Amps
```

```
==============================================================================
   0/PM0       NCS1K4-AC-PSU-2 232.0     0.6     12.1      9.6      OK

Total of Group 0:              139W/0.6A         116W/9.6A

Power Group 1:
==============================================================================
   Power       Supply         ------Input----   ------Output---     Status
   Module      Type            Volts     Amps    Volts     Amps
==============================================================================
   0/PM1       NCS1K4-AC-PSU-2 231.8     0.6     12.1      7.5      OK

Total of Group 1:              139W/0.6A         90W/7.5A

==============================================================================
   Location     Card Type               Power       Power        Status
                                        Allocated   Used
                                        Watts       Watts
==============================================================================
   0/RP0/CPU0   NCS1010-CTR2-B-K9       70          17           ON
   0/FT0        NCS1010-FAN             110         10           ON
   0/FT1        NCS1010-FAN             110         10           ON
   0/FT2        -                       110         0            RESERVED
   0/FT3        -                       110         0            RESERVED
   0/FT4        NCS1020-FAN             73          6            ON
   0/FT5        NCS1020-FAN             73          7            ON
   0/FT6        NCS1020-FAN             73          2            ON
   0/FT7        NCS1020-FAN             73          2            ON
   0/0/NXR0     NCS1K-E-OLT-C           142         81           ON
   0/2/NXR0     NCS1K14-CCMD-16-C       100         20           ON
   0/3/NXR0     NCS1K14-CCMD-16-C       100         20           ON
   0/Rack       NCS1020-SA              45          18           ON
```

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

Verify Context

The **show context** command displays core dump context information of NCS 1020. Core dump is a result of abnormal exit of any process running in the system.

Procedure

show context

Displays the core dump context information of NCS 1020.

Example:

```
RP/0/RP0/CPU0:ios# show context
Mon Sep 27 17:21:59.219 UTC

node: node0_RP0_CPU0
------------------------------------------------------------------
No context
```

The command output is empty during system upgrade.

Verify Core Files

Use the **run** command to go to the hard disk location and check for the core dumps of NCS 1020.

Procedure

run

Example:

```
RP/0/RP0/CPU0:ios# run
Mon Sep 27 17:29:11.163 UTC
[xr-vm_node0_RP0_CPU0:~]$cd /misc/disk1/
[xr-vm_node0_RP0_CPU0:/misc/disk1]$ls -ltr *.gz
```

Verify Memory Information

You can view the memory information using the show watchdog memory-state command.

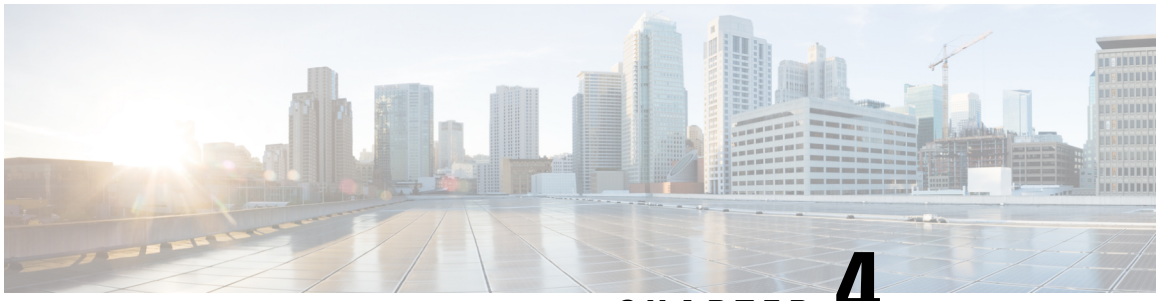
Procedure

show watchdog memory-state location all

Displays memory snapshot in brief.

Example:

```
RP/0/RP0/CPU0:ios#show watchdog memory-state location all
Thu Jun 16 08:36:44.436 UTC
---- node0_RP0_CPU0 ----
Memory information:
    Physical Memory     : 31935.167 MB
    Free Memory         : 29236.0   MB
    Memory State        :   Normal
```



CHAPTER 4

Upgrade Software and FPD

- Software and firmware compatibility matrix, on page 65
- Plan the Software Upgrade , on page 66
- Upgrade the Software, on page 68
- Verify the Software Upgrade, on page 76
- NCS 1020 FPD, on page 77

Software and firmware compatibility matrix

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

Table 3: FPGA firmware compatibility

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

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

Table 4: FPGA firmware compatibility for NCS1K4-AC-PSU-2

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

Table 5: FPGA firmware compatibility for NCS1010-CTR2-B-K9

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

Plan the Software Upgrade

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

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

Backup Current Configuration

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

Procedure

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

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

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

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

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

Step 2 Verify that the configuration is backed up.

Check System Stability

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

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

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

Obtain Install Files

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

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

Standard ISO and RPMs

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

Golden ISO

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

Create Repository to Access Install Files

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

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

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

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

Upgrade the Software

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

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

Software upgrade and downgrade matrix

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

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

Upgrade NCS 1020 Using CLI Commands

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

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

Before you begin

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

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

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

Upgrade NCS 1020 Using YANG Data Models

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

Access Install-related Data Models

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

Procedure

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

Example:

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

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

Example:

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

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

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

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

Use Manageability Agent to Connect to NCS 1020

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

Generate RPC Messages to Install IOS XR Image

Before you begin

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

Procedure

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

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

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

Example:

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

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

View the RPC response received from the NCS 1020.

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

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

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

Example:

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

View the RPC response received from the NCS 1020.

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

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

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

Example:

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

View the RPC response received from the NCS 1020.

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

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

What to do next

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

Install IOS XR Image

Install ISO and RPMs

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

Before you begin

Ensure you have created a repository locally on the NCS 1020 or on a remote server which is reachable over HTTP, HTTPS or FTP. This repository will be used to copy the required RPMsC. Ensure the NCS 1020 can reach the repository server over the Management Ethernet interface. For information about creating the repository to host the RPMs, see Create Repository to Access Install Files, on page 68.

Procedure

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

Example:

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

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

Example:

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

Step 3 Install the base image to upgrade the system.

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

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

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

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

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

  a. Install the image.

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

  b. Apply the changes.

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

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

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

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

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

Install Golden ISO

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

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

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

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

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

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

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

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

Procedure

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

Example:

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

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

Step 2 Install the GISO.

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

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

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

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

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

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

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

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

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

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

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

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

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

b. Apply the changes.

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

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

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

Note

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

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

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

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

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

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

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

Apply the changes.

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

View the software version.

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

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

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

Verify the Software Upgrade

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

This section contains the following topics:

Check System Stability

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

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

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

NCS 1020 FPD

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

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

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

Table 6: NCS 1020 FPDs

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

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

Retrieve FPD Information

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

```
RP/0/RP0/CPU0:ios#sh hw-module fpd
Wed Apr 24 15:54:04.551 IST

Auto-upgrade:Enabled
Attribute codes: B golden, P protect, S secure, A Anti Theft aware
                                                                                FPD Versions
                                                                               ==============
Location   Card type             HWver FPD device       ATR Status   Running Programd
Reload Loc
-----------------------------------------------------------------------------------------------
0/RP0/CPU0 NCS1010-CTR2-B-K9     0.1   ADMCONFIG            CURRENT    1.00    1.00
NOT REQ
0/RP0/CPU0 NCS1010-CTR2-B-K9     0.1   BIOS             S   CURRENT    5.20    5.20
  0/RP0
0/RP0/CPU0 NCS1010-CTR2-B-K9     0.1   BIOS-Golden      BS  CURRENT            1.90
  0/RP0
0/RP0/CPU0 NCS1010-CTR2-B-K9     0.1   CpuFpga          S   CURRENT    1.06    1.06
  0/RP0
0/RP0/CPU0 NCS1010-CTR2-B-K9     0.1   CpuFpgaGolden    BS  CURRENT            1.02
  0/RP0
0/RP0/CPU0 NCS1010-CTR2-B-K9     0.1   SsdMicron5300    S   CURRENT    0.01    0.01
  0/RP0
0/RP0/CPU0 NCS1010-CTR2-B-K9     0.1   TamFw            S   CURRENT    9.07    9.07
  0/RP0
0/RP0/CPU0 NCS1010-CTR2-B-K9     0.1   TamFwGolden      BS  CURRENT            9.06
  0/RP0
0/PM0      NCS1K4-AC-PSU-2       1.0   PO-PriMCU            CURRENT    1.03    1.03
NOT REQ
0/PM0      NCS1K4-AC-PSU-2       1.0   PO-SecMCU            CURRENT    1.05    1.05
NOT REQ
0/PM1      NCS1K4-AC-PSU-2       1.0   PO-PriMCU            CURRENT    1.03    1.03
NOT REQ
0/PM1      NCS1K4-AC-PSU-2       1.0   PO-SecMCU            CURRENT    1.05    1.05
NOT REQ
0/0/NXR0   NCS1K-E-OLT-C         1.0   OLT              S   CURRENT    3.14    3.14
NOT REQ
0/2/NXR0   NCS1K14-CCMD-16-C     1.0   CpuModFw         S   CURRENT   42.14   42.14
NOT REQ
0/2/NXR0   NCS1K14-CCMD-16-C     1.0   OptModFw         S   CURRENT   20.02   20.02
NOT REQ
0/3/NXR0   NCS1K14-CCMD-16-C     1.0   CpuModFw         S   CURRENT   42.14   42.14
NOT REQ
0/3/NXR0   NCS1K14-CCMD-16-C     1.0   OptModFw         S   CURRENT   20.02   20.02
NOT REQ
0/Rack     NCS1020-SA            0.1   ADMCONFIG            CURRENT    1.00    1.00
NOT REQ
0/Rack     NCS1020-SA            0.1   IoFpgaLow        S   CURRENT    1.08    1.08
NOT REQ
0/Rack     NCS1020-SA            0.1   IoFpgaLowGolden  BS  CURRENT            0.07
NOT REQ
0/Rack     NCS1020-SA            0.1   IoFpgaUp         S   CURRENT    1.08    1.08
NOT REQ
0/Rack     NCS1020-SA            0.1   IoFpgaUpGolden   BS  CURRENT            0.06
NOT REQ
0/Rack     NCS1020-SA            0.1   SsdMicron5400    S   CURRENT    0.02    0.02
 0/Rack
```

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

Table 7: Description of Fields in show hw-module fpd Command

Field	Description
Location	Location of the FPD.
Card type	PID of the modules such as chassis, card, CPU, and PSU.
HWver	Hardware version where the FPD resides.
FPD device	Name of the FPD.
ATR	Attribute codes. The possible values are: • B - Golden Image • S - Secure Image • P - Protect Image The attribute code of the primary FPDs is S and the Golden FPDs is BS.
Status	Status of the FPD. See Table 8: Description of FPD Status Values in show hw-module fpd Command, on page 80.
Running	FPD image version that has been activated and currently running in the FPD device.
Programd	FPD image version that has been programmed into the FPD device, but might not be activated.
Reload Loc	Indicates whether reload of the location is required or not.

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

Table 8: Description of FPD Status Values in show hw-module fpd Command

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

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

Verify if an FPD Upgrade is Required

Procedure

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

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

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

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

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

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

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

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

Table 9: Description of Fields in show fpd package Command

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

FPD can be upgraded using two methods:

- Manual upgrade
- Automatic upgrade

Upgrade FPDs Manually

Use the following procedure to upgrade the FPDs manually.

Note The Golden FPDs cannot be upgraded using the CLI.

Procedure

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

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

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

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

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

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

Example:

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

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

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

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

Example:

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

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

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

Example:

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

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

Upgrade FPDs Automatically

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

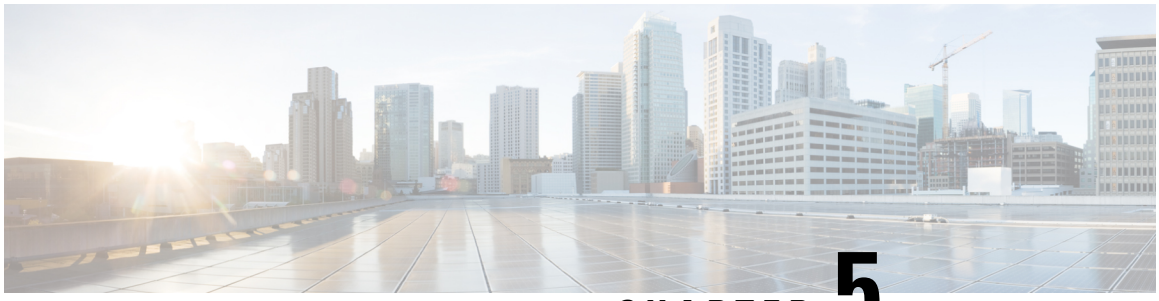
In NCS 1020, automatic FPD upgrade is enabled by default.

Procedure

Use the following commands to disable automatic FPD upgrade.

Example:

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



CHAPTER 5

Disaster Recovery

This chapter describes the disaster recovery process and the health check feature.

- Overview, on page 87
- SSD OIR, on page 87
- CPU Controller Replacement Considerations, on page 87
- Chassis SSD Replacement Considerations, on page 88
- Health Check of Backup ISO Image, on page 88

Overview

There are two partitions in NCS 1020: The controller SSD (CPU partition) and chassis SSD (Disaster Recovery partition). The Disaster Recovery partition contains all the backup configurations such as ISO images, RPMs, and system configuration files. When the node is corrupted, the Disaster Recovery feature allows the CPU to be replaced with the existing configuration. After replacing the CPU, the node reboots and comes up by restoring the software and configuration files from the chassis SSD without traffic loss.

Note When Chassis SSD is corrupted and replaced, the new chassis SSD takes backup of the running software and configuration files from the controller SSD without traffic loss.

SSD OIR

The chassis Solid State Drive (SSD) is a semiconductor-based storage device. It is used to store a backup of the software and configuration which will be used by the CPU to re-boot in case of any node failure. Online Insertion and Removal (OIR) is an operation that allows you to replace any faulty module in a system. In NCS 1020, the SSD OIR feature allows the chassis SSD to be removed and replaced anytime.

CPU Controller Replacement Considerations

You must consider the following points for CPU replacement.

Table 10: CPU Controller Replacement

Type of Replacement	Result
When the CPU is removed from the chassis.	NCS 1020 chassis runs in a headless mode which is non-traffic impacting.
When the CPU is replaced with another CPU having the same software and RPMs as in the chassis SSD.	The configuration is restored from the chassis SSD.
When the CPU is replaced with another CPU having different software and RPMs as in the chassis SSD.	The Disaster recovery process starts. In this case, the node boots with the software from the chassis SSD and the configuration is also restored from the chassis SSD.

Chassis SSD Replacement Considerations

The chassis SSD can be removed in NCS 1020.

You must consider the following points for chassis SSD replacement.

Table 11: Chassis SSD Replacement

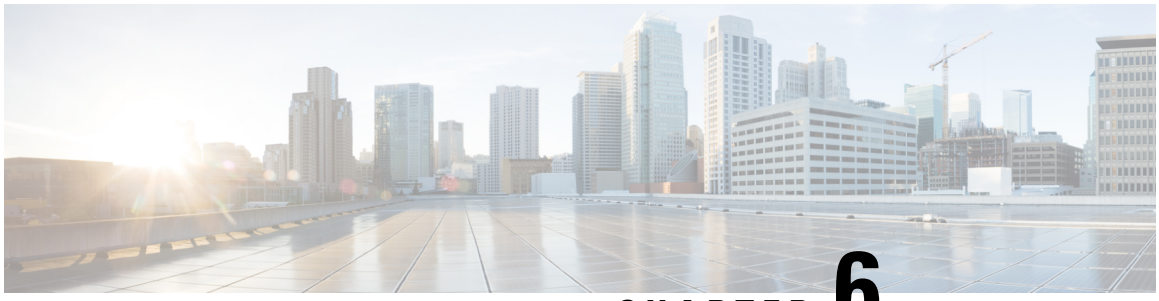
Type of Replacement	Result
When the chassis SSD is removed while the RP is running.	Disaster Recovery boot is disabled and an alarm is raised.
When the chassis SSD is removed.	The Disaster Recovery Unavailable alarm is raised.
When the chassis SSD is replaced with another chassis SSD having the same software and RPMs as in the CPU SSD.	The configuration is backed up from the CPU SSD.
When the Chassis SSD is replaced with another chassis SSD having different software and RPMs as in the CPU SSD.	Software, RPMs, and the configuration are backed up from the CPU SSD.
When the Chassis SSD is replaced with a spare received from Cisco manufacturing or RMA process.	Software, RPMs, and the configuration are backed up from the CPU SSD.

Health Check of Backup ISO Image

The Health Check feature ensures error-free booting of NCS 1020 chassis during disaster recovery operations. NCS 1020 has a partition for disaster recovery where the backup ISO image is stored. The backup ISO image is stored in the chassis SSD.

The chassis SSD content is audited against the running software by the install process in the background every 12 hours to detect corruption. If the ISO image is corrupted, the software will recover it by copying from the

backup location. If the software fails to synchronize with the chassis SSD, then the **Disaster Recovery ISO Image Corruption** alarm is raised. See the *Troubleshooting Guide for Cisco NCS 1020* to clear the alarm.



CHAPTER 6

Connection Verification

This chapter describes the tasks to verify connection between the OLT Line Card of NCS 1020 and NCS1K14-CCMD-16-C line card.

- Power Data Reading, on page 91
- Connection Verification, on page 91

Power Data Reading

Photodiodes (PDs) are optical power monitors available on all input and aggregated output ports to monitor power levels. Tone detection is enabled on some PD monitors.

Table 12: NCS1K-CCMD-16 Calibrated Port References

Port Calibrated	Port Label (Direction)	Minimum Power (dBm)	Maximum Power (dBm)	Dynamic Range (dBm)
LC input ports	(TX)	–50	30	80
LC output ports	(RX)	–50	30	80

Connection Verification

Connection verification checks the connection between the OLT line card and the CCMD-16 line cards to avoid miscabling during the node installation. The dedicated Connection Verification Tunable Laser (CV-TL) available at the OLT card generates a specific probe signal at a given frequency and power. This signal is detected by the CCMD-16 line card that is connected to the OLT line card.

- The same OLT-C line card
- The CCMD-16 line card that is connected to the OLT line card.
- A different unit (OLT-C line card or passive module) belonging to the same NE
- An optical interface (Router ports or Transponder) connected to the OLT-C line card

Connection verification uses a probe signal or adds a low frequency ON/OFF modulation tone transmitting a given tone pattern at 5 Hz (200 ms bit time). The tone pattern length ranges 4–32 bytes (including an

alignment byte) and it includes the Cable-IDs of the cables in the connection and in case also the optical frequency of the specific connection.

The Cable-ID is generated by the Optical Node Controller supervising the complete NE.

The connection verification process uses the out-of-band (OOB) and in-band (IB) WSS frequencies to reach the CCMD-16 line card.

CCMD-16 Connection Verification with OLT

The OLT line card generates the tone and connection verification is performed using the OOB channel with CV-TL tuned at 191.175 THz. To univocally identify the optical path under test, the CV-TL is modulated with a low-frequency pattern including the Cable ID of the connection.

For connection verification toward the CCMD-16 card, the CV-TL is routed to the PD inside the CCMD-16 card. The out-of-band (OOB) and the in-band (IB) connections are verified at two different PDs on the CCMD-16 line cards.

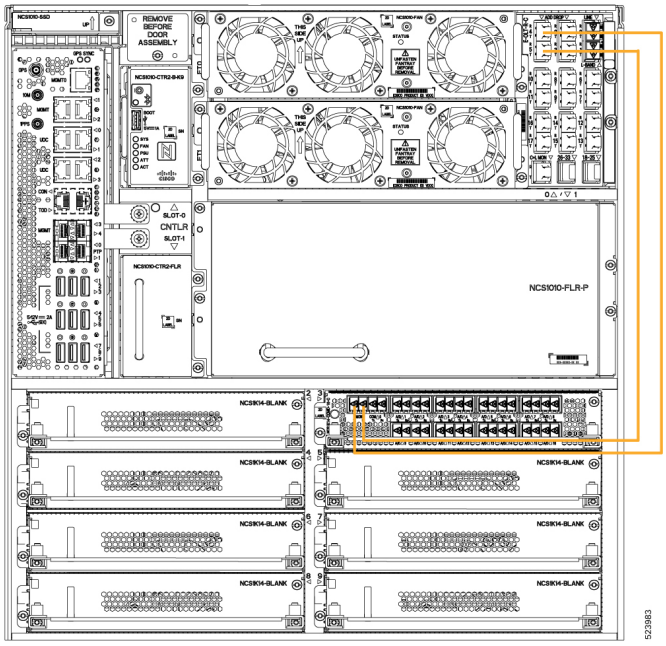
The PD monitors receiving a connection verification signal detect and buffer the Cable-ID pattern encoded in the tone to allow the connection verification process by the node controller.

Verify Connection for CCMD-16 Line Card

The connection verification procedure checks the connection between the OLT line card and CCMD-16 line cards to match the different instances regarding the OLT LC connectors.

The OLT-C line card and the NCS1K-CCMD-16 line card are connected as shown in the following image:

Figure 2: NCS 10120 and NCS1K-CCMD-16 Connection



The OLT-C line card performs connection verification between the OLT-C line card and the NCS1KCCMD-16 line card panels as described in CCMD-16 Connection Verification with OLT, on page 92.

The identification/verification of the NCS1K-CCMD-16 line card is performed by checking the connection verification signal at the monitor present on the OOB loop and IB PD of the NCS1K-CCMD-16 line card respectively.

This task describes on how to verify the connection between the NCS 1010/ NCS 1020 OLT-C line card and NCS1K-CCMD-16 line card.

Start tone-pattern on OTS controller.

Before you begin

Configure the OTS controller in NCS 1020 to generate the tone for connection verification. See Connection Verification on OTS Controller.

Procedure

Step 1 Configure the OTS controller to generate the tone for connection verification.

Example:

```
RP/0/RP0/CPU0:ios(config)#controller ots 0/0/0/4
RP/0/RP0/CPU0:ios(config-Ots)#tone-rate 25
RP/0/RP0/CPU0:ios(config-Ots)#tone-frequency 191.175   ( OOB frequency )
RP/0/RP0/CPU0:ios(config-Ots)#tone-pattern abcd1234
RP/0/RP0/CPU0:ios(config-Ots)#commit
```

Step 2 Configure the OMS controller to detect the tone for connection verification.

Example:

```
RP/0/RP0/CPU0:ios(config)#controller oms 0/2/0/0
RP/0/RP0/CPU0:ios(config-Oms)#tone-rate 25
RP/0/RP0/CPU0:ios(config-Oms)#tone-pattern-expected aabbccdd
RP/0/RP0/CPU0:ios(config-Oms)#tone-detect-oob
RP/0/RP0/CPU0:ios(config-Oms)#commit
```

tone-detect-oob must be configured on the OMS x/x/x/0 for NCS1K-CCMD-16.

Step 3 Start the **tone-pattern** on the OTS controller.

Example:

```
RP/0/RP0/CPU0:ios#tone-pattern controller ots 0/0/0/4 start
Tue May 10 11:37:51.597 UTC
Tone pattern started
```

When tone generation is in progress on the OTS interface, the tone generation on other OTS interfaces is not allowed until the current tone generation is stopped.

Step 4 Use the **tone-pattern-detect** command to start the detection of tone pattern.

Example:

The following is a sample on starting the tone pattern detection on the OMS controller.

```
RP/0/RP0/CPU0:ios#tone-pattern-detect controller oms 0/2/0/0 start
Tue May 10 11:38:03.775 UTC
Tone pattern detect started
```

Step 5 Use the **tone-info** command to check for successful connection verification.

Example:

The following is a sample to view the Tone Info for successful connection verification on the OMS controller.

```
RP/0/RP0/CPU0:ios#show controllers oms 0/2/0/0 tone-info
Fri Sep 22 06:04:03.787 UTC
Tone Info:
Tone Rate : 25 bits/second
Tone Pattern Expected(Hex value) : aabbccdd
Tone Pattern Received(Hex value) : aabbccdd
Tone Detected OOB :  Enabled
Detection State: Success
```

The following is a sample to view the Tone Info for failed connection verification on the OMS controller.

```
RP/0/RP0/CPU0:ios#show controllers oms 0/2/0/0 tone-info
Fri Sep 22 11:10:22.425 UTC
Tone Info:
Tone Frequency : 191.1750000 THz
Tone Rate : 25 bits/second
Tone Pattern Expected(Hex value) : aabbccdd
Tone Pattern Received(Hex value) : 12b36bd3e1
Tone Detected OOB :  Enabled
Detection State: Failed
```

Step 6 After successful connection verification, stop **tone-pattern-detect** on the OMS controller.

Example:

```
RP/0/RP0/CPU0:ios#tone-pattern-detect controller oms 0/2/0/0 stop
Fri Sep 22 06:23:15.165 UTC
Tone pattern detect stopped
```

Step 7 Stop the tone-pattern generation on the OTS controller.

Example:

```
RP/0/RP0/CPU0:ios#tone-pattern controller ots 0/0/0/4 stop
Wed Sep 22 06:25:25.187 UTC
Tone pattern stopped
```

Connection Verification on OTS Controller

This task describes how to check OTS interface connectivity on OLT nodes.

Procedure

Step 1 Start tone-pattern on OTS controller.

Example:

```
RP/0/RP0/CPU0:ios#tone-pattern controller ots 0/0/0/4 start
Wed May 25 11:59:51.040 UTC
Tone pattern started
```

Step 2 Start tone-pattern-detect on OTS controller on one side.

Example:

```
RP/0/RP0/CPU0:ios#tone-pattern-detect controller ots 0/0/0/4 start
Wed May 25 12:00:03.271 UTC
Tone pattern detect started
```

Step 3 Configure the OTS controller to generate the tone for connection verification.

Example:

```
RP/0/RP0/CPU0:ios(config)#controller ots 0/0/0/4
RP/0/RP0/CPU0:ios(config-Ots)#tone-rate 25
RP/0/RP0/CPU0:ios(config-Ots)#tone-frequency 191.175   ( OOB frequency )
RP/0/RP0/CPU0:ios(config-Ots)#tone-pattern abcd1234
RP/0/RP0/CPU0:ios(config-Ots)#tone-detect-oob
RP/0/RP0/CPU0:ios(config-Ots)#tone-pattern-expected abcd1234
RP/0/RP0/CPU0:ios(config-Ots)#commit
```

Step 4 Check for successful connection verification on the Line 2 OTS controller.

Example:

```
RP/0/RP0/CPU0:ios#show controllers ots 0/0/0/4 tone-info
Wed May 25 12:00:11.393 UTC
Tone Info:
Tone Frequency : 191.1750000 THz
Tone Rate : 20 bits/second
Tone Pattern(Hex value) : abcd1234
Tone Pattern Expected(Hex value) : abcd1234
Tone Pattern Received(Hex value) : abcd1234
Tone Detected OOB :  Enabled
 Detection State: Success
```

Step 5 Stop the tone-pattern-detect on the OTS controller.

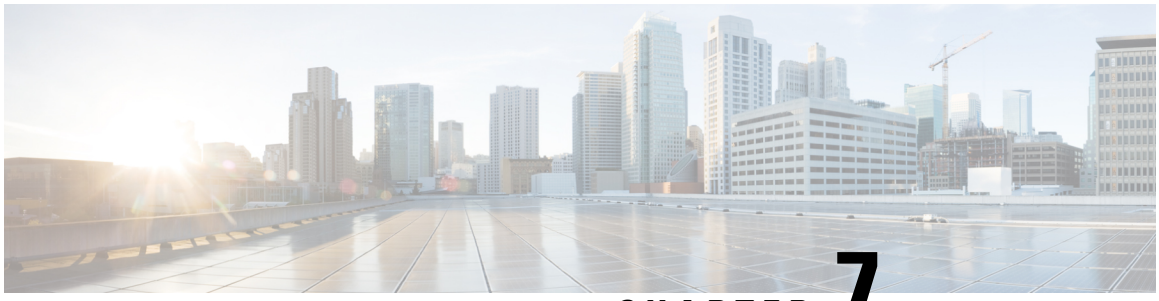
Example:

```
RP/0/RP0/CPU0:ios#tone-pattern-detect controller ots 0/0/0/4 stop
Wed May 25 12:00:56.540 UTC
Tone pattern detect stoped
```

Step 6 Stop the tone-pattern generation on the OTS controller.

Example:

```
RP/0/RP0/CPU0:ios#tone-pattern controller ots 0/0/0/4 stop
Wed May 25 12:01:04.226 UTC
Tone pattern stopped
```



CHAPTER 7

Smart Licensing

This chapter describes the smart licensing configuration on Cisco NCS 1020.

- Understanding Smart Licensing, on page 97
- Available license entitlements for NCS 1020, on page 101
- Create an ID token, on page 102
- Available Smart Licensing transport modes, on page 102
- Reserve Specific Licenses for NCS 1020, on page 107
- License consumption use cases, on page 108

Understanding Smart Licensing

Smart Licensing is a cloud-based, software license management solution that enables you to automate time-consuming, manual licensing tasks. The solution allows you to easily track the status of your license and software usage trends.

Smart Licensing helps you simplify three core functions:

- **Purchasing**: The software that you have installed in your network can be registered, without Product Activation Keys (PAKs).
- **Management**: You can automatically track activations against your license entitlements. Also, there is no need to install the license file on every node. You can create license pools (logical grouping of licenses) to reflect your organization structure. Smart Licensing offers you Cisco Smart Software Manager, a centralized portal that enables you to manage all your Cisco software licenses from one centralized website.
- **Reporting**: Through the portal, Smart Licensing offers an integrated view of the licenses you have purchased and what has been deployed in your network. You can use this data to make better purchasing decisions, based on your consumption.

Smart Licensing Features

- Your device initiates a call home and requests the licenses it needs.
- Pooled licenses - Licenses are company account-specific, and can be used with any compatible device in your company. You can activate or deactivate different types of licenses on the device without actually installing a license file on the device.
- Licenses are stored securely on Cisco servers.

- Licenses can be moved between product instances without license transfer. This greatly simplifies the reassignment of a software license as part of the Return Material Authorization (RMA) process.
- It provides a complete view of all the Smart Software Licenses used in the network using a consolidated usage report of software licenses and devices in one easy-to-use portal.

Cisco Smart Account

Cisco Smart Account is an account where all products enabled for Smart Licensing are deposited. Cisco Smart Account allows you to manage and activate your licenses to devices, monitor license use, and track Cisco license purchases. Through transparent access, you have a real-time view into your Smart Licensing products. IT administrators can manage licenses and account users within your organization's Smart Account through the Smart Software Manager.

When creating a Smart Account, you must have the authority to represent the requesting organization. After you submit the request, it goes through a brief approval process. Access http://software.cisco.com to learn about, set up, or manage Smart Accounts.

Cisco Smart Software Manager enables you to manage all your Cisco Smart software licenses from one centralized website. With Cisco Smart Software Manager, you organize and view your licenses in groups called virtual accounts (collections of licenses and product instances). Use the Cisco Smart Software Manager to do the following tasks:

- Create, manage, or view virtual accounts.
- Create and manage Product Instance ID Tokens.
- Transfer licenses between virtual accounts or view licenses.
- Transfer, remove, or view product instances.
- Run reports against your virtual accounts.
- Modify your email notification settings.
- View overall account information.

Virtual Accounts

A Virtual Account exists as a subaccount tithing the Smart Account. Virtual Accounts are a customer-defined structure based on organizational layout, business function, geography, or any defined hierarchy. They are created and maintained by the Smart Account administrator. Smart Licencing allows you to create multiple license pools or virtual accounts within the Smart Software Manager portal. Using the Virtual Accounts option that you can aggregate licenses into discrete bundles that are associated with a cost center so that one section of an organization cannot use the licenses of another section of the organization. For example, if you segregate your company into different geographic regions, you can create a virtual account for each region to hold the licenses and product instances for that region.

All new licenses and product instances are placed in the default virtual account in the Smart Software Manager, unless you specify a different one during the order process. After you access the default account, you may choose to transfer them to any other account, provided you have the required access permissions.

Use the Smart Software Manager portal to create license pools or transfer licenses.

Product Instance ID Tokens

ID tokens are stored in the Product Instance ID Token Table that is associated with your enterprise account. ID tokens can be valid 1–365 days.

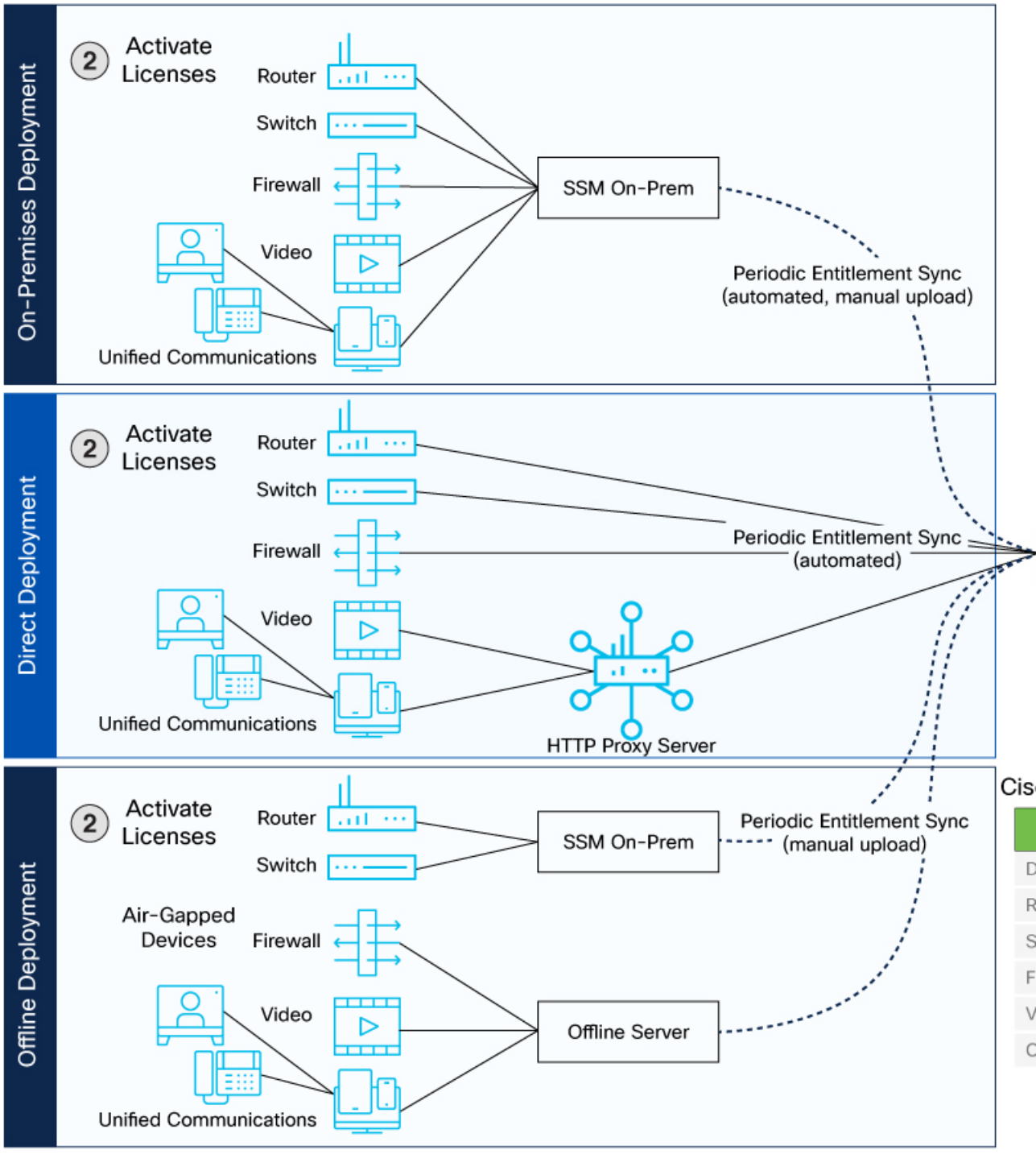
Product Instances

A product instance is an individual device with a unique device identifier (UDI) that is registered using a product instance ID token (or ID token). You can register any number of instances of a product with a single ID token. Each product instance can have one or more licenses residing in the same virtual account. Product instances must periodically connect to the Cisco Smart Software Manager servers during a specific renewal period. If you remove the product instance, its licenses are released and made available within the virtual account.

Smart Licensing Work Flow

The following figure depicts a working model of smart licensing.

Figure 3: Smart Licensing Work Flow



Available license entitlements for NCS 1020

Cisco NCS 1020 supports the Vortex model for smart licensing software. The available license entitlements are categorized as Essential and Advantage. Each category is designed to enable specific features and hardware support.

This is the list of license types and their applicability.

- ILA Essentials: One license per ILA card (maximum one license).
- OLT Essentials: One license per WSS port, per OLT card (maximum 32 licenses). For example, if on an WSS port, multiple cross connections are present, one essential license is consumed, and if multiple add/drop connections are present across multiple WSS ports, that number of ESS licenses are consumed.
- ILA Advantage: One license per ILA card. This license enables omnidirectional cross connections or OTDR access features (maximum one license).
- OLT Advantage: One license per WSS port, per OLT card. This type enables OTDR access, Connection Verification feature, Nyquist channel or omnidirectional cross connects (maximum 32 licenses).
- CCMD Essentials: One license per CCMD card (maximum one license).

Licensing behavior with Nyquist channels

When Nyquist channels are enabled, each cross connection created on a port consumes one Essentials license and one Advantage license.

License entitlement display names and descriptions

The table lists the license entitlements as displayed in Cisco Smart Software Manager (CSSM) and their descriptions:

Table 13: NCS 1020 license entitlements

Display Name in CSSM Server	Description
NCS1010_ADV_ILA_RTU	NCS 1010 ILA Advantage Right-to-Use (RTU)
NCS1010_ADV_ILA_SIA	NCS 1010 ILA Advantage Software Innovation Access (SIA)
NCS1010_ADV_OLT_RTU	NCS 1010 OLT Advantage RTU (per port)
NCS1010_ADV_OLT_SIA	NCS 1010 OLT Advantage SIA (per port)
NCS1010_ESS_ILA_RTU	NCS 1010 ILA Essentials RTU
NCS1010_ESS_ILA_SIA	NCS 1010 ILA Essentials SIA
NCS1010_ESS_OLT_RTU	NCS 1010 OLT Essentials RTU (per port)
NCS1010_ESS_OLT_SIA	NCS 1010 OLT Essentials SIA (per port)
NCS1010_CCMD_CDMS_SIA	NCS 1010 CCMD Essentials SIA

Display Name in CSSM Server	Description
NCS1010_CCMD_CDMS_RTU	NCS 1010 CCMD Essentials RTU

Create an ID token

To create a new token using Cisco Smart Software Manager, perform the following tasks:

Procedure

Step 1 Log in to the Cisco Smart Software Manager.

https://software.cisco.com/software/csws/ws/platform/home#SmartLicensing-Inventory

Step 2 Click the **Inventory** tab, and select your virtual account from the **Virtual Account** drop-down list.

Step 3 Click the **General** tab, and click **New Token**.

The **Create ID Token** window is displayed.

Step 4 Enter the token description. Specify the number of days the token must be active.

Step 5 Check the **Allow export-controlled functionality on the products registered with this token** check box.

Step 6 Click **Create ID Token**.

Step 7 Copy the token and register NCS1020 with the same token ID.

An example of the token ID: YzY2ZjYyNjktY2NlOS00NTc4LWIxNTAtMjZkNmNiNzMxMTY1LTE2NjAzNjQ3%0ANzY4Njl8ZVJSckxKN2pFV2tIeHVoMUkxbGxTazFDVm9kc1B5MGlHQmlFWUJi%0Ac3VNRT0%3D%0A

Available Smart Licensing transport modes

The Smart Licensing software management solution supports four transport modes for license communication and reporting. The default transport mode is Cisco Smart Licensing Utility (CSLU), but you can configure other modes as needed.

The available transport modes are:

- Call-Home: Uses Cisco's Call-Home infrastructure to communicate license usage and status to Cisco Smart Software Manager (SSM).
- Smart transport: Establishes a secure, direct connection between the device and SSM over the internet.
- Cisco Smart Licensing Utility (CSLU): Allows communication with SSM through a local CSLU server, acting as an intermediary between devices and SSM.
- Offline: Enables manual transfer of license usage information via files instead of automated network connectivity.

Configure call home mode

Enable call home mode, configure domain name server and CRL options, set smart license transport to call home, and establish licensing trust on the device.

The Call Home mode will be deprecated in a future release.

Before you begin

Procedure

Step 1 Enable call home service and configure the call home profile.

Example:

```
RP/0/RP0/CPU0:ios#call-home
RP/0/RP0/CPU0:ios(config-call-home)#service active
RP/0/RP0/CPU0:ios(config-call-home)#contact smart-licensing
RP/0/RP0/CPU0:ios(config-call-home)#profile CiscoTAC-1
RP/0/RP0/CPU0:ios(config-call-home-profile)#active
RP/0/RP0/CPU0:ios(config-call-home-profile)#destination address http
https://tools.cisco.com/its/service/oddce/services/DDCEService
RP/0/RP0/CPU0:ios(config-call-home-profile)#reporting smart-call-home-data
RP/0/RP0/CPU0:ios(config-call-home-profile)#reporting smart-licensing-data
RP/0/RP0/CPU0:ios(config-call-home-profile)#destination transport-method email disable
RP/0/RP0/CPU0:ios(config-call-home-profile)#destination transport-method http
RP/0/RP0/CPU0:ios(config-call-home-profile)#commit
RP/0/RP0/CPU0:ios(config-call-home-profile)#end
```

Step 2 Configure the domain name and DNS server.

Example:

```
RP/0/RP0/CPU0:ios#config
RP/0/RP0/CPU0:ios(config)#domain name cisco.com
RP/0/RP0/CPU0:ios(config)#domain name-server 64.102.6.247
RP/0/RP0/CPU0:ios(config)#commit
RP/0/RP0/CPU0:ios(config)#end
```

Step 3 Configure the Certificate Revocation List (CRL) trustpoint.

Example:

```
RP/0/RP0/CPU0:ios#config
RP/0/RP0/CPU0:ios(config)#crypto ca trustpoint Trustpool crl optional
RP/0/RP0/CPU0:ios(config)#commit
RP/0/RP0/CPU0:ios(config)#end
```

Step 4 Set smart license transport to use call home.

Example:

```
RP/0/RP0/CPU0:ios#config
RP/0/RP0/CPU0:ios(config)#License smart transport callhome
RP/0/RP0/CPU0:ios(config)#commit
RP/0/RP0/CPU0:ios(config)#end
```

Step 5 Establish license trust using your ID token.

Example:

```
license smart trust idtoken Zesdf3243u48329fdfhsfhsfkjs1233j4h1j1j4j41n
```

Step 6 Synchronize smart license tokens.

Example:

```
license smart sync all
```

Step 7 Verify your call home and license configuration.

Example:

```
RP/0/RP0/CPU0:ios#show license all
Transport:  Type: Callhome
```

Your device is now configured for call home operation and smart licensing, with the specified DNS and CRL settings. The license transport uses call home, and trust is established.

Configure smart transport license registration

Use this procedure to configure smart transport that can be used as an alternative option to Call Home, to connect to the CSSM.

Procedure

Step 1 Configure the smart proxy and hostname .

Example:

```
RP/0/RP0/CPU0:ios#config
RP/0/RP0/CPU0:ios(config)#license smart proxy port 80
RP/0/RP0/CPU0:ios(config)#license smart proxy hostname proxy.esl.cisco.com
RP/0/RP0/CPU0:ios(config)#commit
RP/0/RP0/CPU0:ios(config)#end
```

Step 2 Enable Certificate Revocation List (CRL) configuration.

Example:

```
RP/0/RP0/CPU0:ios#config
RP/0/RP0/CPU0:ios(config)#crypto ca trustpoint Trustpool crl optional
RP/0/RP0/CPU0:ios(config)#commit
RP/0/RP0/CPU0:ios(config)#end
```

Step 3 Enable Call Home using smart transport .

Example:

```
RP/0/RP0/CPU0:ios#config
RP/0/RP0/CPU0:ios(config)#License smart transport smart
RP/0/RP0/CPU0:ios(config)#commit
RP/0/RP0/CPU0:ios(config)#end
```

Step 4 Verify the smart transport configuration.

Example:

```
RP/0/RP0/CPU0:ios#show license all
Transport:
  Type: Smart
  URL: https://smartreceiver.cisco.com/licservice/license
  Proxy:
    Address: proxy.esl.cisco.com
    Port: 80
    Username: <empty>
    Password: <empty>
  VRF:
    Not Supported
```

Step 5 Establish trust using your Smart Account ID token.

Example:

```
license smart trust idtoken Zesdf3243u48329fdfhsfhsfkjs1233j4h1j1j4j41n
```

Step 6 Sync the token and licenses with CSSM.

Example:

```
license smart sync all
```

Smart transport is configured for license registration, device trust is established with CSSM, and license information is successfully synchronized. Your Cisco NCS 1020 is now registered and ready for smart license management.

Configure CSLU

You can configure CSLU as one of the transport modes, CSLU is the default mode for software licensing policy. To configure CSLU in Cisco NCS 1020, perform the following steps:

Procedure

Step 1 Use this sample configuration to configure the CSLU URL.

Example:

```
RP/0/RP0/CPU0:ios#config
RP/0/RP0/CPU0:ios(config)#license smart url cslu http://10.127.60.58:8182/cslu/v1/pi
RP/0/RP0/CPU0:ios(config)#commit
RP/0/RP0/CPU0:ios(config)#end
```

Step 2 Use this sample configuration to enable CRL Configuration.

Example:

```
RP/0/RP0/CPU0:ios#config
RP/0/RP0/CPU0:ios(config)#crypto ca trustpoint Trustpool crl optional
RP/0/RP0/CPU0:ios(config)#commit
RP/0/RP0/CPU0:ios(config)#end
```

Step 3 Use this sample configuration to enable CSLU.

Example:

```
RP/0/RP0/CPU0:ios#config
RP/0/RP0/CPU0:ios(config)#License smart transport cslu
RP/0/RP0/CPU0:ios(config)#commit
RP/0/RP0/CPU0:ios(config)#end
```

Verify whether CSLU is Configured.

```
RP/0/RP0/CPU0:ios#show license all
Transport:
  Type: cslu
  Cslu address: http://10.127.60.58:8182/cslu/v1/pi
  Proxy:
    Not Configured
  VRF:
    Not Supported
```

Step 4 Use this sample configuration to establish trust using id-token.

Example:

```
license smart trust idtoken Zesdf3243u48329fdfhsfhsfkjs1233j4h1j1j4j41n
```

Step 5 Use this sample configuration to sync the token with the licenses.

Example:

```
license smart sync all
```

Configure Offline

You can configure Offline as one of the options. To configure Offline in Cisco NCS 1020, perform the following steps:

Procedure

Step 1 Use this sample configuration to disable transport.

Example:

```
RP/0/RP0/CPU0:ios#config
RP/0/RP0/CPU0:ios(config)#License smart transport off
RP/0/RP0/CPU0:ios(config)#commit
RP/0/RP0/CPU0:ios(config)#end
```

Step 2 Use this sample configuration to save the report.

Example:

```
RP/0/RP0/CPU0:ios#license smart save usage unreported /misc1/disk1/usage.txt
```

Step 3 Use this sample configuration to import the acknowledgment report.

Example:

```
RP/0/RP0/CPU0:ios#license smart import /misc/disk1/ACK_usage.txt
```

Reserve Specific Licenses for NCS 1020

Specific License Reservation (SLR) lets you reserve a license for your product instance from the CSSM. To reserve specific licenses for NCS 1020, perform the following steps:

Procedure

Step 1 Generate the request code using the**license smart mfg reservation request** local command.

Example:

```
RP/0/RP0/CPU0:iso#license smart mfg reservation request local
Thu Jul 19 13:33:47.241 UTC

Enter this request code in the Cisco Smart Software Manager portal:
DB-ZNCS1020:FCB2717B142-BBTQDthRu-1A
```

Step 2 Use the generated code and generate the authorization code through Cisco Smart Software Manager.

Step 3 Enter the **run** command to launch the iso XR Linux bash shell.

Example:

```
RP/0/RP0/CPU0:iso#run

RP/0/RP0/CPU0:Jul 19 13:35:20.236: run_cmd[67213]: %INFRA-INFRA_MSG.5-RUN_LOGIN : User Cisco logged
 into shell from con0/RP0/CP0
```

Step 4 Create a file using the **vim** *file name* command.

Example:

```
[node0_RP0_CPU0:~]$vim smart1
```

Step 5 Copy the authorization code in the file and type **:wq** to save and exit the file.

Step 6 Use the **exit** command to exit the shell.

Example:

```
[node0_RP0_CPU0:~]$exit
logout
RP/0/RP0/CPU0:Jul 19 13:45:21.146 UTC run-cmd[67213] %INFRA_MSG-5-LOGOUT : User cisco logged out of
 shell from con0/RP0/CPU0
```

Step 7 Install the authorization code using the **license smart mfg reservation install file** command.

Example:

```
RP/0/RP0/CPU0:iso#license smart mfg reservation install file /disk0:/smart1
Thu Jul 19 13:46:22.877 UTC
Last Confirmation code 8572aa81
```

Note
You can verify the number of reservations in the Cisco smart software manger portal and can view the product instance name changed to a UDI.

Step 8 Verify the udi using the **show license udi** command.

Example:

```
RP/0/RP0/CPU0:iso#show license udi
Thu Jul 19 13:43:19.731 UTC
UDI: PID:NCS1020-SA,SN:FCB2546B08T
```

Step 9 Verify the license reservation using the command **show license status**.

Example:

```
RP/0/RP0/CPU0:P2A_DT_08#show license status
Thu Jul 19 15:45:27.137 UTC

Smart Licensing is ENABLED

Utility:
  Status: DISABLED
License Reservation is ENABLED

Data Privacy:
  Sending Hostname: yes
    Callhome hostname privacy: DISABLED
    Smart Licensing hostname privacy: DISABLED
  Version privacy: DISABLED

Transport:
  Type: Transport Off


License Authorization:
  Status: AUTHORIZED - RESERVED on Jul 19 2022 15:21:24 UTC

Export Authorization Key:
  Features Authorized:
    <none>

Miscellaneous:
  Custom Id: <empty>
```

License consumption use cases

In NCS 1020, advanced licenses are consumed based on the features configured.

- For an OLT card, the number of advanced licenses consumed equals the number of essential licenses present when certain advanced features are enabled.
- For an ILA card, only one advanced license is consumed regardless of the number of essential licenses present, when advanced features are enabled.

Examples of license consumption use cases:

- License consumption for overlapping Nyquist channels, on page 109
- License consumption for OTDR scan data, on page 111
- License consumption when tone rate is configured for connection verification, on page 109

License consumption when tone rate is configured for connection verification

When you configure tone rate for connection verification, license consumption is determined by the device type. The examples below show how the license summary output changes when the tone rate configuration is present or removed.

This sample shows the configuration of tone rate for connection verification.

```
RP/0/RP0/CPU0:ios(config)#controller ots 0/0/0/3
RP/0/RP0/CPU0:ios(config-Ots)#tone-rate 25
RP/0/RP0/CPU0:ios(config-Ots)#tone-frequency 191.175
RP/0/RP0/CPU0:ios(config-Ots)#tone-pattern abcd1234
RP/0/RP0/CPU0:ios(config-Ots)#commit
```

This sample displays the license summary output after configuring the tone rate. In addition to the essential licenses, there are the same number of advantage licenses consumed as essential licenses.

```
RP/0/RP0/CPU0:ios#show lic platform summary
Thu Aug 28 14:16:21.188 IST
Collection: LAST: Thu Aug 28 2025 14:15:23 IST
            NEXT: Thu Aug 28 2025 14:16:23 IST
Reporting:  LAST: Thu Aug 28 2025 14:15:23 IST
            NEXT: Thu Aug 28 2025 14:16:23 IST
SIA Status: In Compliance
                                                                    Count
Feature/Area     Entitlement                                      Last Next
============ ================================================== ==== ====
FCM 1         NCS1010 - Essentials Tier - Optical Line Terminal R    3    0
FCM 1         NCS1010 - Essentials Subscription - Optical Line Te    3    0
FCM 1         NCS1010 - Advantage Tier - Optical Line Terminal RT    3    0
FCM 1         NCS1010 - Advantage Subscription - Optical Line Ter    3    0
```

This sample displays the license summary after the tone rate configuration is removed. Only essential licenses are consumed when the tone rate is removed.

```
RP/0/RP0/CPU0:ios#show lic plat sum
Thu Aug 28 15:00:41.565 IST
Collection: LAST: Thu Aug 28 2025 15:00:22 IST
            NEXT: Thu Aug 28 2025 15:01:22 IST
Reporting:  LAST: Thu Aug 28 2025 15:00:22 IST
            NEXT: Thu Aug 28 2025 15:01:22 IST
SIA Status: In Compliance
                                                                    Count
Feature/Area     Entitlement                                      Last Next
============ ================================================== ==== ====
FCM 1         NCS1010 - Essentials Tier - Optical Line Terminal R    3    0
FCM 1         NCS1010 - Essentials Subscription - Optical Line Te    3    0
```

License consumption for overlapping Nyquist channels

When Nyquist channels are configured for omnidirectional cross-connection, both an Essentials license and an Advantage license are consumed for every overlapping Nyquist channel, one of each per channel.

Sample configuring the overlapping Nyquist channel.

```
RP/0/RP0/CPU0:ios#config
RP/0/RP0/CPU0:ios(config)#hw-module location 0/0/NXR0 terminal-ampli grid-mode flex
RP/0/RP0/CPU0:ios(config-hwmod-olt-flexi)#channel-id 191 centre-freq 192.3625 width 50
RP/0/RP0/CPU0:ios(config-hwmod-olt-flexi)#channel-id 192 centre-freq 192.4125 width 55
RP/0/RP0/CPU0:ios(config-hwmod-olt-flexi)#channel-id 193 centre-freq 192.4625 width 50
RP/0/RP0/CPU0:ios(config-hwmod-olt-flexi)#commit
```

This sample displays the overlapping channels highlighted.

```
RP/0/RP0/CPU0:ios#show hw-module location 0/0/nXR0 terminal-ampli
Thu Aug 21 17:42:52.551 IST

Legend:
NXC      - Channel not cross-connected
ACTIVE - Channel cross-connected to data port
ASE        - Channel filled with ASE
FAILED - Data channel failed, pending transition to ASE
PENDING_ACTIVATION - Data Channel pending transition to ACTIVE/FAIL

Location:             0/0/NXR0

Status:               Provisioned

ASE Total Power:      15.70 dBm

Flex Grid Info

Channel Number      Centre Frequency(THz)       Channel Width(GHz)    Channel Status
Overlapping Channels
1                   193.100000                  75.000                ACTIVE
- ,   -
2                   193.900000                  75.000                ACTIVE
- ,   -
3                   195.000000                  75.000                ACTIVE
- ,   -
4                   194.400000                  75.000                ACTIVE
- ,   -
5                   196.100000                  75.000                ACTIVE
- ,   -
6                   195.950000                  75.000                ACTIVE
- ,   -
7                   195.600000                  75.000                ACTIVE
- ,   -
8                   195.450000                  75.000                ACTIVE
- ,   -
191                 192.362500                  50.000                NXC
- , 192
192                 192.412500                  55.000                NXC
191 , 193
193                 192.462500                  50.000                NXC
192 ,   -
```

This sample displays the license summary output after configuring the Nyquist channels. In addition to the essential licenses, an equal number of advantage licenses are consumed.

```
P/0/RP0/CPU0:ios#show lic platform summary
Thu Aug 21 17:45:11.120 IST
Collection: LAST: Thu Aug 21 2025 17:44:33 IST
            NEXT: Thu Aug 21 2025 17:45:33 IST
Reporting:  LAST: Thu Aug 21 2025 17:44:33 IST
            NEXT: Thu Aug 21 2025 17:45:33 IST
**********************************IMPORTANT**********************************
SIA Status: Out of Compliance(Remaining Grace Period: 87 days, 23 hours)
            Number of SIA license(s) used is more than available.
            SW Upgrade will still be allowed as Grace Period is remaining
*****************************************************************************
                                                                      Count
Feature/Area     Entitlement                                       Last Next
============ ================================================== ==== ====
FCM 1        NCS1010 - Essentials Tier - Optical Line Terminal R    8    0
FCM 1        NCS1010 - Essentials Subscription - Optical Line Te    8    0
```

```
FCM 1        NCS1010 - Advantage Tier - Optical Line Terminal RT    8    0
FCM 1        NCS1010 - Advantage Subscription - Optical Line Ter    8    0
FCM 1        Essentials Subscription - CCMD - SIA                   1    0
FCM 1        Essential Tier- CCMD RTU                               1    0
```

License consumption for OTDR scan data

When an OTDR scan status changes to **Data Ready**, the system determines license consumption based on device type. For each completed scan, the same number of Advantage licenses are consumed as Essential licenses.

This output shows a typical result when OTDR scan data status indicates “Data Ready".

```
RP/0/RP0/CPU0:P2B_DT_02_PTP0#show controllers ots 0/0/0/0 otdr-info tx
Tue Aug 26 16:06:56.896 IST
        Scan Direction: TX
        Scan Status: Data Ready
        Total Measured Loss: 0.000000 dB
        Total Measured Length: 9.640000 m
        Optical Return Loss: 23.0 dB
        SOR file: /harddisk:/otdr/P2B_DT_02_PTP0_OTDR_Ots0_0_0_0_TX_20250826-160640.sor
        Total Events detected: 2
        Scan Timestamp: Tue Aug 26 16:06:40 2025 UTC
        Event Type Legend:  NR:Non-Reflective  R:Reflective  FE:Fiber-End
ER:Excess-Reflection EA:Excess-Attenuation

        Event#      |  Detected Event(s)       |  Location(m)     |  Accuracy(m)     |
Magnitude(dB)   |  Attenuation/km(dB)
        1           |  R FE                    |  9.6400          |  2.00            |
-25.81          |  0.00

        2           |  NR FE                   |  9.6400          |  2.00            |
0.00            |  0.00
```

This output displays the license summary. The summary shows the consumption for Essentials and Advantage licenses.

```
 RP/0/RP0/CPU0:P2B_DT_02_PTP0#show lic platform sum
Tue Aug 26 16:11:14.273 IST
Collection: LAST: Tue Aug 26 2025 16:10:43 IST
            NEXT: Tue Aug 26 2025 16:11:43 IST
Reporting:  LAST: Tue Aug 26 2025 16:10:43 IST
            NEXT: Tue Aug 26 2025 16:11:43 IST
SIA Status: In Compliance
                                                                    Count
Feature/Area     Entitlement                                     Last Next
============ ================================================== ==== ====
FCM 1        NCS1010 - Essentials Tier - Optical Line Terminal R    3    0
FCM 1        NCS1010 - Essentials Subscription - Optical Line Te    3    0
FCM 1        NCS1010 - Advantage Tier - Optical Line Terminal RT    3    0
FCM 1        NCS1010 - Advantage Subscription - Optical Line Ter    3    0
```

These are sample outputs where the OTDR scan is stopped.

```
RP/0/RP0/CPU0:ios#otdr-stop controller ots 0/0/0/0 tx
Thu Aug 28 14:05:44.405 IST
OTS OTDR Scan Stopped at TX
RP/0/RP0/CPU0:ios#RP/0/RP0/CPU0:Aug 28 14:05:45.218 IST: osa_driver[271]:
%PLATFORM-OSA-6-OTDR_SCAN_STATUS_INFO : OTDR scan status changed: Ots0/0/0/0 direction: TX
 status: Otdr Scan Stopped scan mode: Auto
```

```
P/0/RP0/CPU0:ios#show controller ots 0/0/0/0 otdr-info tx
Thu Aug 28 14:08:09.117 IST
        Scan Direction: TX
        Scan Status: Stopped
        Total Measured Loss: 0.000000 dB
        Total Measured Length: 9.640000 m
        Optical Return Loss: 23.0 dB
        SOR file: /harddisk:/otdr/P2B_DT_02_PTP0_OTDR_Ots0_0_0_0_TX_20250826-160640.sor
        Total Events detected: 2
        Scan Timestamp: Tue Aug 26 16:06:40 2025 UTC
        Event Type Legend:  NR:Non-Reflective  R:Reflective  FE:Fiber-End
ER:Excess-Reflection EA:Excess-Attenuation

        Event# |  Detected Event(s)  |  Location(m)     |  Accuracy(m)     |  Magnitude(dB)
   |  Attenuation/km(dB)
        1      |  R FE               |  9.6400          |  2.00            |  -25.81
    |  0.00

        2      |  NR FE              |  9.6400          |  2.00            |  0.00
    |  0.00
```

his output displays the license summary. Only Essentials licenses are consumed, as shown in the summary.

```
 RP/0/RP0/CPU0:ios#show lic plat sum
Thu Aug 28 14:08:28.524 IST
Collection: LAST: Thu Aug 28 2025 14:08:22 IST
            NEXT: Thu Aug 28 2025 14:09:22 IST
Reporting:  LAST: Thu Aug 28 2025 14:08:22 IST
            NEXT: Thu Aug 28 2025 14:09:22 IST
SIA Status: In Compliance
                                                                      Count
Feature/Area     Entitlement                                        Last Next
============ ================================================== ==== ====
FCM 1        NCS1010 - Essentials Tier - Optical Line Terminal R    3    0
FCM 1        NCS1010 - Essentials Subscription - Optical Line Te    3    0
```