

Release Notes for Cisco NCS 6000 Series Routers, Release 5.0.1

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The Cisco Network Convergence System (NCS) 6000 series router delivers outstanding network agility, packet optical convergence, and a system scale measured in petabits per second. It also facilitates the build-out of next-generation core to:

- support elastic capacity at the lowest total ownership cost
- deliver high-bandwidth mobile, video, and cloud services

Running the Cisco IOS XR operating system, Cisco's innovative virtualized operating environment, the Cisco NCS 6000 series router advances the concept of distributed routing and virtualization. With Cisco Virtualized IOS XR, the Cisco NCS 6000 series router brings new levels of programmability and virtualization to:

- enhance application service offerings
- increase provisioning speed
- optimize network economics

The Cisco NCS 6000 series router is engineered for environmental efficiency, with the use of adaptable power consumption. The Cisco NCS 6000 series router is powered by the Cisco nPower Network Processor Units (NPU). These technologies aid the Cisco NCS 6000 series router to achieve the lowest carbon footprint in service provider routing.

The Cisco NCS 6008 router, part of the Cisco NCS 6000 series routers, is the next-generation core routing system that provides industry-leading Tbps of full-duplex network bandwidth through single chassis with eight line cards per chassis.

The Cisco NCS 6008 router runs on Cisco IOS XR software with Linux as the underlying host operating system. A Kernel-based Virtual Machine (KVM) hypervisor provides a virtualized environment to independently run system administration and routing functions on separate virtual machines. This provision makes the new system versatile and robust, and provides immense flexibility for future expansion without the need for a complete system overhaul.

A multi-slice architecture of line cards enables the system to be configured in a mixed operating mode, simultaneously supporting traffic at 10 Gbps and 100 Gbps on slice-level granularity.

This release notes describe the features provided in the Cisco IOS XR Software Release 5.0.1 for the Cisco NCS 6000 series router and are updated as needed.

This electronic documents may contain updates and modifications. For more information on obtaining Cisco documentation, see the [Obtaining Documentation and Submitting a Service Request](#), on page 16 section.

For a list of software caveats that apply to Cisco IOS XR Software Release 5.0.1 see the Caveats section.

Cisco IOS XR Software running on the Cisco NCS 6000 Series Router provides the following features and benefits:

- IP features—This supports a wide range of IPv4 and IPv6 services and routing protocols such as IPv4 unicast services, IPv6 unicast services, IPv4 Multicast services, IPv4 and IPv6 equal-cost multipathing (ECMP), IPv4 and IPv6 load balancing), Cisco Discovery Protocol, IPv4 and IPv6 addressing, Internet Control Message Protocol (ICMP), IPv4 LFA FRR, HSRP, and VRRP.
- IP Multicast Features—Multicast forwarding with support for source-based and shared distribution trees and protocols such as Protocol Independent Multicast Sparse Mode (PIM-SM), PIM Source Specific Multicast (PIM SSM), Automatic Rendezvous Point (AutoRP), Internet Group Management Protocol (IGMP) versions 2 and 3, and Multicast reverse path forwarding (RPF). The Multicast nonstop forwarding (NSF) and Multicast forwarding information base (MFIB) protocols are supported.
- Layer 3 routing protocols—This supports routing protocols such as Border Gateway Protocol Version 4 (BGPv4), Open Shortest Path First Version 2 (OSPFv2) and Version 3 (OSPFv3), Intermediate System-to-Intermediate System (IS-IS) Protocol, NSF using graceful restart for IS-IS, OSPF, and BGP.
- Forwarding features—This supports routing protocols such as Access control lists (ACLs), QoS and class of service (CoS) using modular QoS command-line interface (CLI; MQC), IP packet classification and marking, Queuing (ingress and egress), Policing (ingress and egress), Diagnostic and network management support, Link Bundles, Bi-Direction Forwarding detection (BFD), LACP, and Ethernet OAM Link Monitoring (IEEE 802.3ah).
- Multiprotocol Label Switching (MPLS) Features—Supports MPLS features such as MPLS Label Distribution Protocol (LDP), Resource Reservation Protocol (RSVP), Diffserv Aware Traffic Engineering (TE), MPLS Traffic Engineering control plane (RFCs 2702 and 2430), MPLS forwarding, MPLS load balancing, NSF for RSVP and LDP, and MPLS FRR.
- Security—Features such as Message Digest Algorithm (MD5), Control packet policing, Dynamic control plane protection, and GTSM RFC 3682 (formerly BTSH) are supported.
- Accounting—This supports features such as IP and MPLS Accounting, Interface Counters and Statistics, and Sampled Netflow (IPv4, IPv6, and MPLS).
- Control packet policing
- Dynamic control plane protection
- GTSM RFC 3682 (formerly BTSH)
- Network Management—This supports features like Enhanced CLI, XML interface, Simple Network Management Protocol (SNMP) and MIB support - (SNMPv1,SNMPv2c,SNMPv3), and Cisco Prime Network
- System redundancy—Features such as Power redundancy 1:1 or 1:N, Fan tray redundancy 1:1, Route processor redundancy 1:1, Virtual machine redundancy, Line-card online insertion and removal (OIR) support, Fabric card OIR support, Out of resource management, and IOS XR redundancy.

What is New in Release 5.0.1

Software Features

- 100 Gigabit Ethernet PHY Monitoring—The IEEE 802.3ba standard provides the ability to actively monitor the bit error rate (BER) of each 100 Gigabit Ethernet and 40 Gigabit Ethernet links at the receiving PHY. The two additional configurable BER thresholds are Signal Degrade (SD) and Signal Fail (SF) for each link. Both SD and SF can be configured to generate an alarm when the threshold is crossed. Additionally, SF can be configured to signal Remote Fault to the other end and bring the link down when the threshold is crossed.
- BGP policy accounting—BGP policy accounting uses (PA) traffic indices that are set on BGP routes to track various counters.
- BFD Over Member Links on Link Bundles—BFD supports BFD sessions on individual physical bundle member links to monitor Layer 3 connectivity on those links, rather than just at a single bundle member.
- Faster Creation of Bootable USB Drive—The bootable USB drive can now be created by copying the compressed boot file to the USB drive and unzipping it.
- FTP and SFTP Support for Install Add Command—The FTP and SFTP transfer protocols can be used for file transfer while using the **install add** command.
- Install Prepare Support for System Upgrade—The **install prepare** command can be run on ISO images while performing system upgrade.
- Install Verify Packages—The **install verify packages** command checks the installed packages for anomalies and inconsistencies.
- IPv6 VPN Provider Edge—IPv6 VPN Provider Edge (6PE) uses the existing MPLS IPv4 core infrastructure for IPv6 transport. 6PE enables IPv6 sites to communicate with each other over an MPLS IPv4 core network using MPLS label switched paths (LSPs).
- Line Card Slice Shutdown—It is possible to shutdown unused slices of line cards to conserve power and troubleshooting.
- Kernel SMU Support—Installing a kernel SMU results in updating the kernel or making changes to third party components running on the host, System Admin VM and XR VM.
- Reverse Path Forwarding (Strict and Loose)—Unicast IPv4 and IPv6 Reverse Path Forwarding (uRPF), both strict and loose modes, help mitigate problems caused by the introduction of malformed or spoofed IP source addresses into a network by discarding IP packets that lack a verifiable IP source address.
- VRF-Aware Service Infrastructure—VRF-Aware Service Infrastructure (VASI) refers to the capability to use services, such as those that run on a multi-service blade (MSB), within different VPN routing and forwarding instances (VRFs). VASI interfaces are virtual interface pairs, where each of the interfaces in the pair is associated with a different VRF. Such a virtual interface is the next hop interface for any packet that needs to be switched between these two VRFs. The service can then be attached to these virtual interfaces.

Hardware Features

- 60-Port 10Gbps Line Card with SFP+ Optics Module—The following modules are supported:
 - Lean Core (NC6-60X10GE-L-S) and Multi-Service Core (NC6-60X10GE-M-S)
 - 60x10GE PAT LC SW
 - SFP-10G-SR Optics
 - SFP-10G-SR-X Optics
 - SFP-10G-LR Optics
 - SFP-10G-LR-X Optics
 - SFP-10G-ER Optics
 - SFP-10G-ZR Optics
- CPAK SR-10 Optics supported for 10-Port 100Gbps Line Card.

Related Documentation

The most current Cisco NCS 6000 Series Router software documentation is located at this URL:

<http://www.cisco.com/c/en/us/support/routers/network-convergence-system-6000-series-router/tsd-products-support-series-home.html>

Caveats

Caveats describe unexpected behavior in Cisco IOS XR Software releases. Severity-1 caveats are the most critical caveats; severity-2 caveats are less critical.

Release 5.0.1

Bug ID	Severity	Headline
CSCul33665	2	NGN: lpts policer configuration for a slot is removed on LC OIR in that slot.
CSCum24247	2	SNMP times out while polling Entity/ISIS MIB.
CSCum44205	2	LC reloads continuously on slice shutdown trigger.
CSCum58789	2	LC gets powered off and boots with backup BIOS with slices shut.
CSCum21280	3	Not able to telnet into XR after tep restart.
CSCum60652	3	IPv6 NA Header Flow Label is Not Zero.

Bug ID	Severity	Headline
CSCum96819	3	Installation of packages fail when an inventory mismatch occurs during the install activate operation.
CSCun00724	3	A false alarm reporting that FPDs are incompatible, is displayed for DC power modules.

Cisco Bug Search Tool

Bug Search Tool (BST), the online successor to Bug Toolkit, is designed to improve the effectiveness in network risk management and device troubleshooting. The tool allows partners and customers to search for software bugs based on product, release, and keyword, and aggregates key data such as bug details, product, and version. The tool has provision to filter bugs based on credentials to provide external and internal bug views for the search input.

Use the BST to view the list of outstanding and resolved bugs in a release.

The BST is available at [Bug Search](#). To search for a specific bug, go to <https://tools.cisco.com/bugsearch/bug/bugid>. For more information on BST, see [Bug Search Help](#).

Search Bugs in BST

Follow these instructions to search for bugs that are specific to Cisco IOS XR software release 5.0.1 in BST.

-
- Step 1** Go to <https://tools.cisco.com/bugsearch/>.
Log in to the tool using your Cisco.com user name and password. After successful login, the Bug Search Tool page opens.
- Step 2** To search for release 5.0.1 bugs, enter the following parameters in the page:
- Product—Select **Series**, enter **Cisco NCS 6008 - 8-Slot Chassis** in the text box. You can alternately navigate to the product name from the **Select from list** link.
 - Releases—Enter 5.0.1.
 - Show Bugs—Select **Affecting or Fixed in these Releases**.
- Step 3** Press **Enter**.
- Note**
- By default, the search results include bugs with all severity levels and statuses, and bugs that were modified during the life cycle of the bug. After you perform a search, you can filter your search results to meet your search requirements.
 - An initial set of 25 search results is shown in the bottom pane. Drag the scroll bar to display the next set of 25 results. Pagination of search results is not supported.
-

Release 5.0.1 Packages

This table lists the Cisco IOS XR Software feature set matrix (packages) and associated filenames available for the Cisco IOS XR Software Release 5.0.1 that is supported on the Cisco NCS 6008 router.

Table 1: Cisco IOS XR Software Release 5.0.1 Packages

Feature Set	Filename	Description
Composite Package		
Cisco IOS XR IP Unicast Routing Core Bundle	ncs6k-mini-x.iso-5.0.1	Contains the required core packages, including OS, Admin, Base, Forwarding, Modular Services Card, Routing, SNMP Agent, FPD, and Alarm Correlation.
Optional Individual Packages (Packages are installed individually)		
Cisco IOS XR Manageability Package	ncs6k-mgbl.pkg-5.0.1	Extensible Markup Language (XML) Parser and HTTP server packages.
Cisco IOS XR MPLS Package	ncs6k-mpls.pkg-5.0.1	MPLS Traffic Engineering (MPLS-TE), Label Distribution Protocol (LDP), MPLS Forwarding, MPLS Operations, Administration, and Maintenance (OAM), Link Manager Protocol (LMP), Optical User Network Interface (OUNI), Resource Reservation Protocol (RSVP), and Layer-3 VPN.
Cisco IOS XR Multicast Package	ncs6k-mcast.pkg-5.0.1	Multicast Routing Protocols (PIM, Multicast Source Discovery Protocol [MSDP], Internet Group Management Protocol [IGMP], Auto-RP), Tools (SAP, MTrace), and Infrastructure [(Multicast Routing Information Base [MRIB], Multicast-Unicast RIB [MURIB], and Multicast forwarding [MFWD]).

Cisco IOS XR Security Package	ncs6k-k9sec.pkg-5.0.1	Support for Encryption, Decryption, IP Security (IPSec), Secure Shell (SSH), Secure Socket Layer (SSL), and Public-key infrastructure (PKI) (Software based IPSec support—maximum of 500 tunnels)
Cisco IOS XR Documentation Package	ncs6k-doc.pkg-5.0.1	.man pages for Cisco IOS XR Software.

This table lists the TAR files.

Table 2: Cisco IOS XR Software Release 5.0.1 TAR Files

Feature Set	Filename	Description
Cisco IOS XR IP/MPLS Core Software	NCS6000-iosxr-5.0.1.tar	<ul style="list-style-type: none"> • Cisco IOS XR IP Unicast Routing Core Bundle • Cisco IOS XR Manageability Package • Cisco IOS MPLS Package • Cisco IOS XR Multicast Package
Cisco IOS XR IP/MPLS Core Software 3DES	NCS6000-iosxr-k9-5.0.1.tar	<ul style="list-style-type: none"> • Cisco IOS XR IP Unicast Routing Core Bundle • Cisco IOS XR Manageability Package • Cisco IOS XR MPLS Package • Cisco IOS XR Multicast Package • Cisco IOS XR Security Package

The show version Command

To determine the version of Cisco IOS XR Software running on your router, log in to the router and enter the **show version** command. Use this command to validate that the Cisco IOS XR Software version is the latest on your router.

SUMMARY STEPS

1. Establish a Telnet session with the router.
2. Enter **show version** command from XR EXEC mode.

DETAILED STEPS

Step 1 Establish a Telnet session with the router.

Step 2 Enter **show version** command from XR EXEC mode.

```
RP/0/RP0/CPU0:router# show version
Cisco IOS XR Software, Version 5.0.1
Copyright (c) 2014 by Cisco Systems, Inc.

Build Information:
Built By      : palwal
Built On     : Tue Feb  4 13:35:37 PST 2014
Build Host   : iox-bld4
Workspace    : /auto/srcarchive9/production/5.0.1/all/workspace
Version      : 5.0.1
Location     : /opt/cisco/XR/packages/

System uptime is 16 minutes
```

System Requirements

Memory Requirements



Caution If you remove the media in which the software image or configuration is stored, the router may become unstable and fail.

The minimum memory requirements for a Cisco NCS 6008 router running Cisco IOS XR Software Release 5.0.1 consist of the following:

- 48 GB memory on the NCS 6008 Route Processors (NCS6-RP)
- 16 GB memory on line cards

Supported Hardware

The following table lists the supported hardware components on the Cisco NCS 6000 Series Router and the minimum required software release. For more information, see the *Firmware Support* section.

Table 3: Cisco NCS 6008 Router Hardware and Software Compatibility Matrix

Component	Part Number	Support from Release
60-port 10Gbps SFP+ Lean Core Line card	NC6-60X10GE-L-S	5.0.1
60-port 10Gbps SFP+ Multi-Service Core Line card	NC6-60X10GE-M-S	5.0.1
Cisco 10GBASE-SR SFP+ Module for MMF	SFP-10G-SR	5.0.1
Cisco 10GBASE-SR SFP+ Module for MMF, extended temperature range	SFP-10G-SR-X	5.0.1
Cisco 10GBASE-LR SFP+ Module for SMF	SFP-10G-LR	5.0.1
Cisco multirate 10GBASE-LR, 10GBASE-LW and OTU2e SFP+ Module for SMF, extended temperature range	SFP-10G-LR-X	5.0.1
Cisco 10GBASE-ER SFP+ Module for SMF	SFP-10G-ER	5.0.1
Cisco 10GBASE-ZR SFP+ Module for SMF	SFP-10G-ZR	5.0.1
NCS 6008 - 8-Slot Chassis	NCS-6008	5.0.0
NCS 6008 Fabric Card	NC6-FC	5.0.0
NCS 6008 Route Processor	NC6-RP	5.0.0
NCS 6008 Chassis Fan Tray	NC6-FANTRAY	5.0.0
NCS AC Power Tray	NCS-AC-PWRTRAY	5.0.0
NCS DC Power Tray	NCS-DC-PWRTRAY	5.0.0
NCS PDU Bracket	NCS-PDU-BRKT	5.0.0
NCS 6008 3-to-1 Phase DELTA PDU	NCS-PDU-DELTA	5.0.0
NCS 6008 3-to-1 Phase WYE PDU	NCS-PDU-WYE	5.0.0

Component	Part Number	Support from Release
NCS 100x10GE Patch Panel Short Reach	NCS-PP-100X10-SR	5.0.0
NCS 6000 10x100G Multi-Service CPAK	NC6-10X100G-M-K	5.0.0
NCS 6000 10x100G Multi-Service CXP	NC6-10X100G-M-P	5.0.0
NCS 6000 10x100G LSR CPAK	NC6-10X100G-L-K	5.0.0
NCS 6000 10x100G LSR CXP	NC6-10X100G-L-P	5.0.0
NCS Craft Panel Display Kit	NCS-CRFT	5.0.0
NCS 6008 Chassis Front Doors	NC6-DOOR-F	5.0.0
NCS 6008 Chassis Rear Doors	NC6-DOOR-R	5.0.0
NCS 6008 Chassis Drill Template	NC6-DRILLTEMP	5.0.0
NCS 6008 Chassis Front-Bottom Grille	NC6-GRILLE-FB	5.0.0
NCS 6008 Chassis Front-Top Grille	NC6-GRILLE-FT	5.0.0
NCS 6008 Chassis Rear Grille	NC6-GRILLE-R	5.0.0
NCS 6008 Power Control Module	NC6-PCM	5.0.0
NCS 6008 Chassis Trough	NC6-TROUGH	5.0.0
NCS 6008 Chassis Trough Wide	NC6-TROUGH-W	5.0.0
NCS 6008 & NCS Fabric Chassis Lift Dolly	NCS-LIFT	5.0.0
10X10G-LR Cisco CPAK module for SMF	CPAK-10X10G-LR	5.0.0
CPAK-100G-LR4 Transceiver module, 10 km SMF	CPAK-100G-LR4	5.0.0
CXP-100G-SR10 transceiver Module	CXP-100G-SR10	5.0.0

Firmware Support

To check the firmware code running on the Cisco NCS 6008 router, Release 5.0.1, run the **show hw-module fpd** command and **show fpd package** command in System Admin EXEC mode.

RP/0/RP0/CPU0:router(admin)# **show fpd package**

```

=====
                                Field Programmable Device Package
                                =====
Card Type          FPD Description          Req   SW   Min Req  Min Req
=====          =====          Reload Ver   SW Ver  Board Ver
=====
NC6-4-10X100G-M-K  BAO-MB FPGA              NO    1.00  1.00    0.0
                   BAO-DB FPGA              NO    1.00  1.00    0.0
                   S2 GN2411                YES   3.02  3.02    2.0
                   S3 GN2411                YES   3.02  3.02    2.0
                   S4 GN2411                YES   3.02  3.02    2.0
                   S2 GN2411                YES   2.08  2.08    0.0
                   S3 GN2411                YES   2.08  2.08    0.0
                   S4 GN2411                YES   2.08  2.08    0.0
                   CCC FPGA                 YES   2.07  2.07    0.0
                   CCC Bootloader           YES   2.07  2.07    0.0
                   CCC Power-On            YES   1.31  1.31    0.0
                   Backup CCC PwrOn         YES   1.31  1.31    0.0
                   Ethernet Switch         YES   1.32  1.32    0.0
                   Backup EthSwitch       YES   1.32  1.32    0.0
                   Primary BIOS          YES  10.02  10.02   0.0
                   Backup BIOS          YES  10.02  10.02   0.0
-----
NC6-FC             CCC FPGA                 YES   1.18  1.18    0.0
                   CCC Power-On            YES   1.31  1.31    0.0
-----
NC6-10X100G-L-K  BAO-MB FPGA              NO    1.00  1.00    0.0
                   BAO-DB FPGA              NO    1.00  1.00    0.0
                   CPAK bay 0 LR4           YES   1.16  1.16    0.0
                   CPAK bay 1 LR4           YES   1.16  1.16    0.0
                   CPAK bay 2 LR4           YES   1.16  1.16    0.0
                   CPAK bay 3 LR4           YES   1.16  1.16    0.0
                   CPAK bay 4 LR4           YES   1.16  1.16    0.0
                   CPAK bay 5 LR4           YES   1.16  1.16    0.0
                   CPAK bay 6 LR4           YES   1.16  1.16    0.0
                   CPAK bay 7 LR4           YES   1.16  1.16    0.0
                   CPAK bay 8 LR4           YES   1.16  1.16    0.0
                   CPAK bay 9 LR4           YES   1.16  1.16    0.0
                   CPAK bay 0 SR10        YES   2.03  2.03    0.0
                   CPAK bay 1 SR10        YES   2.03  2.03    0.0
                   CPAK bay 2 SR10        YES   2.03  2.03    0.0
                   CPAK bay 3 SR10        YES   2.03  2.03    0.0
                   CPAK bay 4 SR10        YES   2.03  2.03    0.0
                   CPAK bay 5 SR10        YES   2.03  2.03    0.0
                   CPAK bay 6 SR10        YES   2.03  2.03    0.0
                   CPAK bay 7 SR10        YES   2.03  2.03    0.0
                   CPAK bay 8 SR10        YES   2.03  2.03    0.0
                   CPAK bay 9 SR10        YES   2.03  2.03    0.0
                   S2 GN2411                YES   3.02  3.02    2.0
                   S3 GN2411                YES   3.02  3.02    2.0
                   S4 GN2411                YES   3.02  3.02    2.0
                   S2 GN2411                YES   2.08  2.08    0.0
                   S3 GN2411                YES   2.08  2.08    0.0
                   S4 GN2411                YES   2.08  2.08    0.0
                   CCC FPGA                 YES   2.07  2.07    0.0
                   CCC Bootloader           YES   2.07  2.07    0.0
                   CCC Power-On            YES   1.31  1.31    0.0
                   Backup CCC PwrOn         YES   1.31  1.31    0.0
                   Ethernet Switch         YES   1.32  1.32    0.0
                   Backup EthSwitch       YES   1.32  1.32    0.0
                   Primary BIOS          YES  10.02  10.02   0.0
                   Backup BIOS          YES  10.02  10.02   0.0
-----
NC6-6-10X100G-L-K  BAO-MB FPGA              NO    1.00  1.00    0.0

```

	BAO-DB FPGA	NO	1.00	1.00	0.0
	S2 GN2411	YES	3.02	3.02	2.0
	S3 GN2411	YES	3.02	3.02	2.0
	S4 GN2411	YES	3.02	3.02	2.0
	S2 GN2411	YES	2.08	2.08	0.0
	S3 GN2411	YES	2.08	2.08	0.0
	S4 GN2411	YES	2.08	2.08	0.0
	CCC FPGA	YES	2.07	2.07	0.0
	CCC Bootloader	YES	2.07	2.07	0.0
	CCC Power-On	YES	1.31	1.31	0.0
	Backup CCC PwrOn	YES	1.31	1.31	0.0
	Ethernet Switch	YES	1.32	1.32	0.0
	Backup EthSwitch	YES	1.32	1.32	0.0
	Primary BIOS	YES	10.02	10.02	0.0
	Backup BIOS	YES	10.02	10.02	0.0

PROTO-CXP-2XPITA	BAO-MB FPGA	NO	1.00	1.00	0.0
	Slice-0 GN2411	YES	3.02	3.02	2.0
	Slice-1 GN2411	YES	3.02	3.02	2.0
	Slice-0 GN2411	YES	2.08	2.08	0.0
	Slice-1 GN2411	YES	2.08	2.08	0.0
	CCC FPGA	YES	2.07	2.07	0.0
	CCC Bootloader	YES	2.07	2.07	0.0
	CCC Power-On	YES	1.31	1.31	0.0
	Backup CCC PwrOn	YES	1.31	1.31	0.0
	Ethernet Switch	YES	1.32	1.32	0.0
	Backup EthSwitch	YES	1.32	1.32	0.0
	Primary BIOS	YES	10.02	10.02	0.0
	Backup BIOS	YES	10.02	10.02	0.0

NC6-FANTRAY	Fantray FPGA	NO	2.01	2.01	0.0

P-L-20X40G-QSFP	BAO-MB FPGA	NO	0.23	0.23	0.0
	BAO-DB FPGA	NO	0.23	0.23	0.0
	Slice-0 GN2411	YES	3.02	3.02	2.0
	Slice-1 GN2411	YES	3.02	3.02	2.0
	Slice-0 GN2411	YES	2.08	2.08	0.0
	Slice-1 GN2411	YES	2.08	2.08	0.0
	Slice-2 GN2411	YES	3.02	3.02	2.0
	Slice-3 GN2411	YES	3.02	3.02	2.0
	Slice-4 GN2411	YES	3.02	3.02	2.0
	Slice-2 GN2411	YES	2.08	2.08	0.0
	Slice-3 GN2411	YES	2.08	2.08	0.0
	Slice-4 GN2411	YES	2.08	2.08	0.0
	S2 GN2411	YES	3.02	3.02	2.0
	S3 GN2411	YES	3.02	3.02	2.0
	S4 GN2411	YES	3.02	3.02	2.0
	S2 GN2411	YES	2.08	2.08	0.0
	S3 GN2411	YES	2.08	2.08	0.0
	S4 GN2411	YES	2.08	2.08	0.0
	CCC FPGA	YES	2.07	2.07	0.0
	CCC Bootloader	YES	2.07	2.07	0.0
	CCC Power-On	YES	1.31	1.31	0.0
	Backup CCC PwrOn	YES	1.31	1.31	0.0
	Ethernet Switch	YES	1.32	1.32	0.0
	Backup EthSwitch	YES	1.32	1.32	0.0
	Primary BIOS	YES	10.02	10.02	0.0
	Backup BIOS	YES	10.02	10.02	0.0

NC6-10X100G-M-P	BAO-MB FPGA	NO	1.00	1.00	0.0
	BAO-DB FPGA	NO	1.00	1.00	0.0
	Slice-0 GN2411	YES	3.02	3.02	2.0
	Slice-1 GN2411	YES	3.02	3.02	2.0
	Slice-0 GN2411	YES	2.08	2.08	0.0
	Slice-1 GN2411	YES	2.08	2.08	0.0
	Slice-2 GN2411	YES	3.02	3.02	2.0
	Slice-3 GN2411	YES	3.02	3.02	2.0
	Slice-4 GN2411	YES	3.02	3.02	2.0
	Slice-2 GN2411	YES	2.08	2.08	0.0
	Slice-3 GN2411	YES	2.08	2.08	0.0
	Slice-4 GN2411	YES	2.08	2.08	0.0
	S2 GN2411	YES	3.02	3.02	2.0
	S3 GN2411	YES	3.02	3.02	2.0

	S4 GN2411	YES	3.02	3.02	2.0
	S2 GN2411	YES	2.08	2.08	0.0
	S3 GN2411	YES	2.08	2.08	0.0
	S4 GN2411	YES	2.08	2.08	0.0
	CCC FPGA	YES	2.07	2.07	0.0
	CCC Bootloader	YES	2.07	2.07	0.0
	CCC Power-On	YES	1.31	1.31	0.0
	Backup CCC PwrOn	YES	1.31	1.31	0.0
	Ethernet Switch	YES	1.32	1.32	0.0
	Backup EthSwitch	YES	1.32	1.32	0.0
	Primary BIOS	YES	10.02	10.02	0.0
	Backup BIOS	YES	10.02	10.02	0.0

NC6-10X100G-M-K	BAO-MB FPGA	NO	1.00	1.00	0.0
	BAO-DB FPGA	NO	1.00	1.00	0.0
	CPAK bay 0 LR4	YES	1.16	1.16	0.0
	CPAK bay 1 LR4	YES	1.16	1.16	0.0
	CPAK bay 2 LR4	YES	1.16	1.16	0.0
	CPAK bay 3 LR4	YES	1.16	1.16	0.0
	CPAK bay 4 LR4	YES	1.16	1.16	0.0
	CPAK bay 5 LR4	YES	1.16	1.16	0.0
	CPAK bay 6 LR4	YES	1.16	1.16	0.0
	CPAK bay 7 LR4	YES	1.16	1.16	0.0
	CPAK bay 8 LR4	YES	1.16	1.16	0.0
	CPAK bay 9 LR4	YES	1.16	1.16	0.0
	CPAK bay 0 SR10	YES	2.03	2.03	0.0
	CPAK bay 1 SR10	YES	2.03	2.03	0.0
	CPAK bay 2 SR10	YES	2.03	2.03	0.0
	CPAK bay 3 SR10	YES	2.03	2.03	0.0
	CPAK bay 4 SR10	YES	2.03	2.03	0.0
	CPAK bay 5 SR10	YES	2.03	2.03	0.0
	CPAK bay 6 SR10	YES	2.03	2.03	0.0
	CPAK bay 7 SR10	YES	2.03	2.03	0.0
	CPAK bay 8 SR10	YES	2.03	2.03	0.0
	CPAK bay 9 SR10	YES	2.03	2.03	0.0
	S2 GN2411	YES	3.02	3.02	2.0
	S3 GN2411	YES	3.02	3.02	2.0
	S4 GN2411	YES	3.02	3.02	2.0
	S2 GN2411	YES	2.08	2.08	0.0
	S3 GN2411	YES	2.08	2.08	0.0
	S4 GN2411	YES	2.08	2.08	0.0
	CCC FPGA	YES	2.07	2.07	0.0
	CCC Bootloader	YES	2.07	2.07	0.0
	CCC Power-On	YES	1.31	1.31	0.0
	Backup CCC PwrOn	YES	1.31	1.31	0.0
	Ethernet Switch	YES	1.32	1.32	0.0
	Backup EthSwitch	YES	1.32	1.32	0.0
	Primary BIOS	YES	10.02	10.02	0.0
	Backup BIOS	YES	10.02	10.02	0.0

NC6-10X100G-L-P	BAO-MB FPGA	NO	1.00	1.00	0.0
	BAO-DB FPGA	NO	1.00	1.00	0.0
	Slice-0 GN2411	YES	3.02	3.02	2.0
	Slice-1 GN2411	YES	3.02	3.02	2.0
	Slice-0 GN2411	YES	2.08	2.08	0.0
	Slice-1 GN2411	YES	2.08	2.08	0.0
	Slice-2 GN2411	YES	3.02	3.02	2.0
	Slice-3 GN2411	YES	3.02	3.02	2.0
	Slice-4 GN2411	YES	3.02	3.02	2.0
	Slice-2 GN2411	YES	2.08	2.08	0.0
	Slice-3 GN2411	YES	2.08	2.08	0.0
	Slice-4 GN2411	YES	2.08	2.08	0.0
	S2 GN2411	YES	3.02	3.02	2.0
	S3 GN2411	YES	3.02	3.02	2.0
	S4 GN2411	YES	3.02	3.02	2.0
	S2 GN2411	YES	2.08	2.08	0.0
	S3 GN2411	YES	2.08	2.08	0.0
	S4 GN2411	YES	2.08	2.08	0.0
	CCC FPGA	YES	2.07	2.07	0.0
	CCC Bootloader	YES	2.07	2.07	0.0
	CCC Power-On	YES	1.31	1.31	0.0
	Backup CCC PwrOn	YES	1.31	1.31	0.0
	Ethernet Switch	YES	1.32	1.32	0.0

	Backup EthSwitch	YES	1.32	1.32	0.0
	Primary BIOS	YES	10.02	10.02	0.0
	Backup BIOS	YES	10.02	10.02	0.0

NC6-RP	CCC FPGA	YES	2.03	2.03	0.0
	CCC Bootloader	YES	2.03	2.03	0.0
	CCC Power-On	YES	1.32	1.32	0.0
	Backup CCC PwrOn	YES	1.32	1.32	0.0
	Ethernet Switch	YES	1.32	1.32	0.2
	Backup EthSwitch	YES	1.32	1.32	0.2
	Ethernet Switch	YES	1.32	1.32	0.0
	Backup EthSwitch	YES	1.32	1.32	0.0
	Primary BIOS	YES	10.02	10.02	0.0
	Backup BIOS	YES	10.02	10.02	0.0
	CPU Complex FPGA	YES	4.06	4.06	0.1
	CPU Complex BOOT	YES	4.06	4.04	0.1
	CPU Complex FPGA	YES	0.01	0.01	0.0
	CPU Complex BOOT	YES	0.01	0.01	0.0

PWR-2KW-DC-V2	DT-PrimCU	NO	6.03	6.03	0.12
	DT-Sec54vMCU	NO	6.02	6.02	0.12
	DT-Sec5vMCU	NO	6.03	6.03	0.12
	EM-PrimCU	NO	3.12	3.12	0.21
	EM-Sec54vMCU	NO	3.19	3.19	0.21
	EM-Sec5vMCU	NO	3.19	3.19	0.21

PWR-3KW-AC-V2	DT-PrimCU	NO	6.02	6.02	1.0
	DT-Sec54vMCU	NO	6.02	6.02	1.0
	DT-Sec5vMCU	NO	6.04	6.04	1.0
	EM-Sec54vMCU	NO	3.12	3.12	0.21
	EM-Sec5vMCU	NO	3.18	3.18	0.21

NC6-60X10GE-L-S	BAO-MB FPGA	NO	0.23	0.23	0.0
	BAO-DB FPGA	NO	0.23	0.23	0.0
	Slice-0 GN2411	YES	3.02	3.02	2.0
	Slice-1 GN2411	YES	3.02	3.02	2.0
	Slice-0 GN2411	YES	2.08	2.08	0.0
	Slice-1 GN2411	YES	2.08	2.08	0.0
	Slice-2 GN2411	YES	3.02	3.02	2.0
	Slice-3 GN2411	YES	3.02	3.02	2.0
	Slice-4 GN2411	YES	3.02	3.02	2.0
	Slice-2 GN2411	YES	2.08	2.08	0.0
	Slice-3 GN2411	YES	2.08	2.08	0.0
	Slice-4 GN2411	YES	2.08	2.08	0.0
	S2 GN2411	YES	3.02	3.02	2.0
	S3 GN2411	YES	3.02	3.02	2.0
	S4 GN2411	YES	3.02	3.02	2.0
	S2 GN2411	YES	2.08	2.08	0.0
	S3 GN2411	YES	2.08	2.08	0.0
	S4 GN2411	YES	2.08	2.08	0.0
	CCC FPGA	YES	2.07	2.07	0.0
	CCC Bootloader	YES	2.07	2.07	0.0
	CCC Power-On	YES	1.31	1.31	0.0
	Backup CCC PwrOn	YES	1.31	1.31	0.0
	Ethernet Switch	YES	1.32	1.32	0.0
	Backup EthSwitch	YES	1.32	1.32	0.0
	Primary BIOS	YES	10.02	10.02	0.0
	Backup BIOS	YES	10.02	10.02	0.0

PROTO-CXP-1XPITA	BAO-MB FPGA	NO	1.00	1.00	0.0
	Slice-1 GN2411	YES	3.02	3.02	2.0
	Slice-1 GN2411	YES	2.08	2.08	0.0
	CCC FPGA	YES	2.07	2.07	0.0
	CCC Bootloader	YES	2.07	2.07	0.0
	CCC Power-On	YES	1.31	1.31	0.0
	Backup CCC PwrOn	YES	1.31	1.31	0.0
	Ethernet Switch	YES	1.32	1.32	0.0
	Backup EthSwitch	YES	1.32	1.32	0.0
	Primary BIOS	YES	10.02	10.02	0.0
	Backup BIOS	YES	10.02	10.02	0.0

NC6-60X10GE-M-S	BAO-MB FPGA	NO	0.23	0.23	0.0
	BAO-DB FPGA	NO	0.23	0.23	0.0

	S2 GN2411	YES	3.02	3.02	2.0
	S3 GN2411	YES	3.02	3.02	2.0
	S2 GN2411	YES	2.08	2.08	0.0
	S3 GN2411	YES	2.08	2.08	0.0
	CCC FPGA	YES	2.07	2.07	0.0
	CCC Bootloader	YES	2.07	2.07	0.0
	CCC Power-On	YES	1.31	1.31	0.0
	Backup CCC PwrOn	YES	1.31	1.31	0.0
	Ethernet Switch	YES	1.32	1.32	0.0
	Backup EthSwitch	YES	1.32	1.32	0.0
	Primary BIOS	YES	10.02	10.02	0.0
	Backup BIOS	YES	10.02	10.02	0.0
	Modena 0 PHY	YES	0.13	0.13	0.0
	Modena 1 PHY	YES	0.13	0.13	0.0
	Modena 2 PHY	YES	0.13	0.13	0.0
	Modena 3 PHY	YES	0.13	0.13	0.0
	Modena 4 PHY	YES	0.13	0.13	0.0
	Modena 5 PHY	YES	0.13	0.13	0.0
	Modena 6 PHY	YES	0.13	0.13	0.0
	Modena 7 PHY	YES	0.13	0.13	0.0
	Modena 8 PHY	YES	0.13	0.13	0.0
	Modena 9 PHY	YES	0.13	0.13	0.0
	Modena 10 PHY	YES	0.13	0.13	0.0
	Modena 11 PHY	YES	0.13	0.13	0.0
	Modena 12 PHY	YES	0.13	0.13	0.0
	Modena 13 PHY	YES	0.13	0.13	0.0
	Modena 14 PHY	YES	0.13	0.13	0.0
	Modena 15 PHY	YES	0.13	0.13	0.0

PROTO-1XPAT-QSFP	BAO-MB FPGA	NO	0.23	0.23	0.0
	CCC FPGA	YES	2.07	2.07	0.0
	CCC Bootloader	YES	2.07	2.07	0.0
	CCC Power-On	YES	1.31	1.31	0.0
	Backup CCC PwrOn	YES	1.31	1.31	0.0
	Ethernet Switch	YES	1.32	1.32	0.0
	Backup EthSwitch	YES	1.32	1.32	0.0
	Primary BIOS	YES	10.02	10.02	0.0
	Backup BIOS	YES	10.02	10.02	0.0

PROTO-2XPAT-SFP	BAO-MB FPGA	NO	0.23	0.23	0.0
	CCC FPGA	YES	2.07	2.07	0.0
	CCC Bootloader	YES	2.07	2.07	0.0
	CCC Power-On	YES	1.31	1.31	0.0
	Backup CCC PwrOn	YES	1.31	1.31	0.0
	Ethernet Switch	YES	1.32	1.32	0.0
	Backup EthSwitch	YES	1.32	1.32	0.0
	Primary BIOS	YES	10.02	10.02	0.0
	Backup BIOS	YES	10.02	10.02	0.0
	Modena 0 PHY	YES	0.13	0.13	0.0
	Modena 1 PHY	YES	0.13	0.13	0.0
	Modena 2 PHY	YES	0.13	0.13	0.0
	Modena 3 PHY	YES	0.13	0.13	0.0
	Modena 4 PHY	YES	0.13	0.13	0.0
	Modena 5 PHY	YES	0.13	0.13	0.0
	Modena 6 PHY	YES	0.13	0.13	0.0
	Modena 7 PHY	YES	0.13	0.13	0.0

PROTO-2XPAT-SFP-L	BAO-MB FPGA	NO	0.23	0.23	0.0
	CCC FPGA	YES	2.07	2.07	0.0
	CCC Bootloader	YES	2.07	2.07	0.0
	CCC Power-On	YES	1.31	1.31	0.0
	Backup CCC PwrOn	YES	1.31	1.31	0.0
	Ethernet Switch	YES	1.32	1.32	0.0
	Backup EthSwitch	YES	1.32	1.32	0.0
	Primary BIOS	YES	10.02	10.02	0.0
	Backup BIOS	YES	10.02	10.02	0.0

PROTO-1XPAT-SFP	BAO-MB FPGA	NO	0.23	0.23	0.0
	CCC FPGA	YES	2.07	2.07	0.0
	CCC Bootloader	YES	2.07	2.07	0.0
	CCC Power-On	YES	1.31	1.31	0.0
	Backup CCC PwrOn	YES	1.31	1.31	0.0
	Ethernet Switch	YES	1.32	1.32	0.0

Backup EthSwitch	YES	1.32	1.32	0.0
Primary BIOS	YES	10.02	10.02	0.0
Backup BIOS	YES	10.02	10.02	0.0

Minimum Firmware Requirement

The following table provides the procedures and resources for minimum firmware requirements:

After completing an Return Material Authorization (RMA), upgrade the firmware as per the matrix in this link, which also links to PDF copies of the IOS XR Firmware Upgrade Guides	http://www.cisco.com/web/Cisco_IOS_XR_Software/index.html
For the upgrade procedure, see the <i>Performing System Upgrade and Installing Feature Packages</i> chapter of the <i>Cisco NCS 6008 System Setup and Software Installation Guide</i>	http://www.cisco.com/en/US/products/ps13132/tsd_products_support_series_home.html

Important Notes

- **Country-specific laws, regulations, and licenses**—In certain countries, use of these products may be prohibited and subject to laws, regulations, or licenses, including requirements applicable to the use of the products under telecommunications and other laws and regulations; customers must comply with all such applicable laws in the countries in which they intend to use the products.
- **Field replaceable unit (FRU) removal**—For all card removal and replacement (including fabric cards, line cards, fan controller, and RP) follow the instructions provided by Cisco to avoid impact to traffic. See the *Cisco Network Convergence System 6000 Series Routers Hardware Installation Guide* for procedures.
- **Exceeding Cisco testing**—If you intend to test beyond the combined maximum configuration tested and published by Cisco, contact your Cisco Technical Support representative to discuss how to engineer a large-scale configuration for your purpose.
- **reload**—The reload command in the system admin mode reloads a line card, not a VM.

Obtaining Documentation and Submitting a Service Request

For information on obtaining documentation, using the Cisco Bug Search Tool (BST), submitting a service request, and gathering additional information, see [What's New in Cisco Product Documentation](#).

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