Release Notes for Cisco CRS-1 and Cisco CRS-3 for Cisco IOS XR Software Release 4.2

March 15, 2013

Cisco IOS XR Software Release 4.2

Text Part Number OL-26124-01

These release notes describe the features provided in the Cisco IOS XR Software Release 4.2 for the Cisco CRS router and are updated as needed.

Note For information on the Cisco CRS router running Cisco IOS XR Software Release 4.2, see the "Important Notes" section on page 40.

You can find the most current Cisco IOS XR software documentation at:

http://www.cisco.com/en/US/products/ps5763/tsd_products_support_series_home.html

These electronic documents may contain updates and modifications. For more information on obtaining Cisco documentation, see the "Obtaining Documentation and Submitting a Service Request".

For a list of software caveats that apply to Cisco IOS XR Software Release 4.2, see the "Caveats" section on page 46. The caveats are updated for every release and are described at www.cisco.com.

We recommend that you view the field notices for this release located at the following URL to see if your software or hardware platforms are affected:

http://www.cisco.com/public/support/tac/fn_index.html

Contents

These release notes contain the following sections:

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Introduction

Cisco IOS XR Software is a distributed operating system designed for continuous system operation combined with service flexibility and high performance.

Cisco IOS XR Software running on the Cisco CRS router provides the following features and benefits:

- **IP and Routing**—This supports a wide range of IPv4 and IPv6 services and routing protocols; such as Border Gateway Protocol (BGP), Routing Information Protocol (RIPv2), Intermediate System-to-Intermediate System (IS-IS), Open Shortest Path First (OSPF), IP Multicast, Routing Policy Language (RPL), Hot Standby Router Protocol (HSRP), and Virtual Router Redundancy Protocol features (VRRP).
- **BGP Prefix Independent Convergence**—This provides the ability to converge BGP routes within sub seconds instead of multiple seconds. The Forwarding Information Base (FIB) is updated, independent of a prefix, to converge BGP routes with the occurrence of a single failure. This convergence is applicable to both core and edge failures and with or without MPLS. This fast convergence innovation is unique to Cisco IOS XR Software.
- **Multiprotocol Label Switching (MPLS)**—This supports MPLS protocols, including Traffic Engineering (TE), Resource Reservation Protocol (RSVP), Label Distribution Protocol (LDP), Virtual Private LAN Service (VPLS), Layer 2 Virtual Private Network (L2VPN), and Layer 3 Virtual Private Network (L3VPN).
- **Multicast—**This provides comprehensive IP Multicast software including Source Specific Multicast (SSM) and Protocol Independent Multicast (PIM) in Sparse Mode only, and Bidirectional Protocol Independent Multicast (BIDIR-PIM).
- **Quality of Service (QoS)—**This supports QoS mechanisms including policing, marking, queuing, random and hard traffic dropping, and shaping. Additionally, Cisco IOS XR Software also supports modular QoS command-line interface (MQC). MQC is used to configure QoS features.
- **Manageability—**This provides industry-standard management interfaces including modular command-line interface (CLI), Simple Network Management Protocol (SNMP), and native Extensible Markup Language (XML) interfaces. Includes a comprehensive set of Syslog messages.
- **Security—**This provides comprehensive network security features including access control lists (ACLs); routing authentications; Authentication, Authorization, and Accounting (AAA)/Terminal Access Controller Access Control System (TACACS+), Secure Shell (SSH), Management Plane Protection (MPP) for management plane security, and Simple Network Management Protocol version3 (SNMPv3). Control plane protections integrated into line card Application-Specific Integrated Circuits (ASICs) include Generalized TTL Security Mechanism (GTSM), RFC 3682, and Dynamic Control Plane Protection (DCPP).

- **Availability—**This supports rich availability features such as fault containment, fault tolerance, fast switchover, link aggregation, nonstop routing for ISIS, LDP, BGP, and OSPF, and nonstop forwarding (NSF).
- **Multicast service delivery in SP NGN—**MVPNv4 support carries multicast traffic over an ISP MPLS core network.
- **IPv6 Provider Edge Router support for IPv6 applications**—This delivers IPv6 traffic over an IPv4/MPLS core with IPv6 provider edge router (6PE) support.
- **IPv6 VPN over MPLS (6VPE) support**—This delivers IPv6 VPN over MPLS (IPv6) VPN traffic over an IPv4 or MPLS core with 6VPE support.
- **Carrier Grade Network Address Translation (CGN)—**This enables service providers to execute orderly transitions to IPv6 through mixed IPv4 and IPv6 networks. CGN provides address family translation but is not limited to just translation within one address family. CGN delivers a comprehensive solution suite for IP address management and IPv6 transition.
- **Enhanced core competencies:**
  - IP fast convergence with Fast Reroute (FRR) support for Intermediate System-to-Intermediate System (IS-IS) and OSPF
  - Traffic engineering support for unequal load balancing
  - Traffic engineering over generic routing encapsulation (GRE) tunnel interfaces—LDP, L2VPN, and L3VPN over TE over GRE are supported. VPN routes over TE and over GRE, require a labelled path for path resolution.
  - VRF support for GRE tunnel interfaces—This support includes GRE tunnel interfaces under a VRF, however the GRE tunnel source and destination are in the global table.
  - RSVP support over GRE tunnels
  - Path Computation Element (PCE) capability for traffic engineering

For more information about new features provided on the Cisco CRS router for Cisco IOS XR Software Release 4.2, see the "New Cisco CRS Router Software Features" section on page 32 in this document.

System Requirements

This section describes the system requirements for Cisco IOS XR Software Release 4.2 supported on the Cisco CRS router. The system requirements include the following information:

To determine the software versions or levels of your current system, see the "Determining Your Software Version" section on page 23.

Cisco CRS Feature Set Table

Table 1 lists the Cisco IOS XR Software feature set matrix (PIE files) and associated filenames available for the Cisco IOS XR Software Release 4.2 supported on the Cisco CRS router.

Table 1 Cisco CRS Supported Feature Sets (Cisco IOS XR Software Release 4.2 PIE Files)

Feature Set	Filename	Description
Composite Package		
Cisco IOS XR IP Unicast Routing Core Bundle	hfr-mini-px-4.2.0	Contains the required core packages, including OS, Admin, Base, Forwarding, Modular Services Card, Routing, SNMP Agent, and Alarm Correlation.
Cisco IOS XR IP Unicast Routing Core Bundle	hfr-mini-px.vm-4.2.0	Contains the required core packages including OS, Admin, Base, Forwarding, Modular Services Card, Routing, SNMP Agent, and Alarm Correlation.
Optional Individual Packages[1]		
Cisco IOS XR Manageability Package	hfr-mgbl-px.pie-4.2.0	CORBA[2] agent, XML[3] Parser, and HTTP server packages.
Cisco IOS XR MPLS Package	hfr-mpls-px.pie-4.2.0	MPLS-TE,[4] LDP,[5] MPLS Forwarding, MPLS OAM,[6] LMP,[7] OUNI,[8] RSVP,[9] and Layer-2 VPN and Layer-3 VPN.
Cisco IOS XR Multicast Package	hfr-mcast-px.pie-4.2.0	Multicast Routing Protocols (PIM, MSDP,[10] IGMP,[11] Auto-RP), Tools (SAP, MTrace), and Infrastructure (MRIB,[12] MURIB[13], MFWD[14]), and BIDIR-PIM.[15]
Cisco IOS XR Security Package	hfr-k9sec-px.pie-4.2.0	Support for Encryption, Decryption, IPSec,[16]SSH,[17] SSL,[18]and PKI[19] (Software based IPSec support—maximum of 500 tunnels)
Cisco IOS XR FPD Package	hfr-fpd-px.pie-4.2.0	Firmware for Fixed PLIM[20] and SPA[21] modules as well as ROMMON[22] images for Cisco CRS chassis.
Cisco IOS XR Diagnostic Package	hfr-diags-px.pie-4.2.0	Diagnostic utilities for Cisco IOS XR routers.
Cisco IOS XR Documentation Package	hfr-doc-px.pie-4.2.0	.man pages for Cisco IOS XR Software on the Cisco CRS chassis.
Cisco IOS XR Upgrade Package	hfr-upgrade-px.pie-4.2.0	Upgrade from P to PX image.

1. Packages are installed individually
2. Common Object Request Broker Architecture
3. Extensible Markup Language
4. MPLS Traffic Engineering
5. Label Distribution Protocol
6. Operations, Administration, and Maintenance
7. Link Manager Protocol
8. Optical User Network Interface
9. Resource Reservation Protocol
10. Multicast Source Discovery Protocol
11. Internet Group Management Protocol

12. Multicast Routing Information Base
13. Multicast-Unicast RIB
14. Multicast forwarding
15. Bidirectional Protocol Independent Multicast
16. IP Security
17. Secure Shell
18. Secure Socket Layer
19. Public-key infrastructure
20. Physical layer interface module
21. Shared port adapters
22. ROM monitor

Table 2 lists the Cisco CRS Router TAR files.

Table 2 Cisco CRS Supported Feature Sets (Cisco IOS XR Software Release 4.2 TAR Files)

Feature Set	Filename	Description
Cisco IOS XR IP/MPLS Core Software	CRS-iosxr-px-4.2.0.tar	• 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 Diagnostic Package • Cisco IOS XR FPD Package
Cisco IOS XR IP/MPLS Core Software 3DES	CRS-iosxr-px-k9-4.2.0.tar	• 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 • Cisco IOS XR Diagnostic Package • Cisco IOS XR FPD Package

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 CRS running Cisco IOS XR Software Release 4.2 consist of the following:

- 4-GB memory on the route processors (RPs)

- 2-GB memory on Modular Services Card (MSC-40) and Forwarding Processor (FP-40)
- 4-GB memory on MSC-140 and FP-140
- 4-GB PCMCIA Flash Disk

Hardware Supported

All hardware features are supported on Cisco IOS XR Software, subject to the memory requirements specified in the "Memory Requirements" section on page 5.

Table 3 lists the supported hardware components on the Cisco CRS and the minimum required software versions. For more information, see the "Other Firmware Support" section on page 11.

Table 3 Cisco CRS Supported Hardware and Minimum Software Requirements

Component	Part Number	Support from Version
Cisco CRS Series 16-Slot Line Card Chassis		
Cisco CRS 16-Slot Line Card Chassis	CRS-16-LCC	3.2
Cisco CRS Fan Tray for 16-Slot LCC	CRS-16-LCC-FAN-TR	3.2
Cisco CRS Fan Controller for 16-Slot Line Card Chassis	CRS-16-LCC-FAN-CT	3.2
Cisco CRS 16-Slot Alarm Board	CRS-16-ALARM	3.2
Cisco CRS AC Delta Power Shelf for 16-Slot LCC	CRS-16-LCC-PS-ACD	3.2
Cisco CRS AC Wye Power Shelf for 16-Slot LCC	CRS-16-LCC-PS-ACW	3.2
Cisco CRS DC Power Shelf for 16-Slot LCC	CRS-1-LCC-PS-DC	3.2
Cisco CRS LCC Front AC Power Panel	CRS-16-ACGRILLE	3.2
Cisco CRS LCC Front DC Power Panel	CRS-16-DCGRILLE	3.2
Cisco CRS Line Card Chassis Front Doors	CRS-16-LCC-DRS-F	3.2
Cisco CRS Line Card Chassis Front Cable Mgmt	CRS-16-LCC-FRNT	3.2
Cisco CRS LCC Expanded Front Cable Mgmt	CRS-16-LCC-FRNT-E	3.2
Cisco CRS Line Card Chassis Rear Cable Mgmt	CRS-16-LCC-BCK-CM	3.2
Cisco CRS Line Card Chassis Rear Doors	CRS-16-LCC-DRS-R	3.2
Cisco CRS Lift for LCC 16 and FCC	CRS-16-LIFT/B	3.2
Cisco CRS DC PEM for 16 slot LCC and FCC	CRS-16-DC-PEM	3.2
Cisco CRS 16 Slot System Reduced-Noise DC PEM	CRS-16-DC-PEM-B	3.8
Cisco CRS 16 Slot System Reduced-Noise Fan Tray	CRS-16-LCC-FNTR-B	3.8
Cisco CRS Series LC Chassis Fan Controller	CRS-16-LCC-F-CT-B	4.0.1PX
Cisco CRS 16-Slot Enhanced Line Card Chassis	CRS-16-LCC-B	4.0.3
Cisco CRS Series 8-Slot Line Card Chassis		
Cisco CRS 8-Slot Install Kit	CRS-8-INSTALL-KT	N/A
Cisco CRS 8-Slot Fork Lift Tube	CRS-8-LIFT-TUBE	N/A
Cisco CRS 8-Slot Front Badge Panel	CRS-8-BDG-PANEL	N/A
Cisco CRS 8-Slot Front Inlet Grill	CRS-8-FRNT-GRILL	N/A
Cisco CRS 8-Slot Horizontal Install Rails	CRS-8-HRZ-RAILS	N/A

Table 3 Cisco CRS Supported Hardware and Minimum Software Requirements (continued)

Component	Part Number	Support from Version
Cisco CRS 8-Slot Line Card Chassis	CRS-8-LCC	3.2
Cisco CRS Fan Tray for 8-Slot Line Card Chassis	CRS-8-LCC-FAN-TR	3.2
Cisco CRS Line Card Chassis Filter Pack	CRS-8-LCC-FILTER	3.2
Cisco CRS AC Pwr Rectifier for 8-Slot LCC	CRS-8-AC-RECT	3.2
Cisco CRS DC Power Entry Module for 8-Slot LCC	CRS-8-DC-PEM	3.2
Cisco CRS AC & DC Power Module Filter for 8-Slot LCC	CRS-8-PWR-FILTER	3.2
Cisco CRS AC Delta PDU for CRS-8 LCC	CRS-8-LCC-PDU-ACD	3.2
Cisco CRS AC Wye PDU for CRS-8 LCC	CRS-8-LCC-PDU-ACW	3.2
Cisco CRS DC PDU for CRS-8 LCC	CRS-8-LCC-PDU-DC	3.2
Cisco CRS 8-Slot Enhanced Line Card Chassis	CRS-8-LCC-B	4.2.0
Cisco CRS Series 4-Slot Line Card Chassis		
Cisco CRS-1 4-Slot Single-Shelf System	CRS-4/S	3.4
Cisco CRS Fabric Chassis Hardware		
CRS-FCC= Cisco CRS-1 Series Fabric Card Chassis Only	CRS-FCC=	3.2
CRS-1 Fabric Chassis AC Delta Power Kit	CRS-FCC-ACD-KIT	3.2
CRS-1 Fabric Chassis AC Grille	CRS-FCC-ACGRILLE	3.2
CRS-1 Fabric Chassis AC-Wye Power Kit	CRS-FCC-ACW-KIT	3.2
CRS Fabric Chassis DC Power Kit	CRS-FCC-DC-KIT	3.2
CRS-1 Fabric Chassis DC Power Grille	CRS-FCC-DCGRILLE	3.2
CRS Fabric Chassis Lift Bracket	CRS-FCC-LIFT-BRKT	3.2
CRS Fabric Chassis OIM Modules	CRS-FCC-OIM-1S=	3.2
Cisco CRS-1 Series FC Chassis Shelf/Fan/Enet cntr	CRS-FCC-SC-GE=	3.2
CRS-1 Fabric Chassis AC Intake Grille	CRS-FCC-ACGRILLE=	3.2
CRS-1 Fabric Chassis DC Intake Grille	CRS-FCC-DCGRILLE=	3.2
Cisco CRS-1 Series Fan Tray for FCC	CRS-FCC-FAN-TR=	3.2
CRS-1 Fabric Card Chassis Fan Tray Filters	CRS-FCC-FILTER=	3.2
CRS-1 Fabric Chassis Front Cosmetic Kit	CRS-FCC-FRNT-CM=	3.2
Cisco CRS-1 Series Fabric Card Chassis Fiber Module LED	CRS-FCC-LED=	3.2
Cisco CRS-1 Series DC Power Shelf for FCC	CRS-FCC-PS-DC=	3.2
CRS-1 Fabric Chassis Rear Cosmetic Kit	CRS-FCC-REAR-CM=	3.2
CRS-LIFT Brackets for Fabric Chassis	CRS-FCC-LIFT-BRKT=	3.2
CRS Fabric Chassis OIM Module	CRS-FCC-OIM-1S	3.2
CRS-1 Fabric Chassis AC Delta Power Supply	CRS-FCC-PS-ACD	3.2
CRS-1 Fabric Chassis AC Wye Option	CRS-FCC-PS-ACW	3.2
CRS-1 Fabric Chassis DC Power Option	CRS-FCC-PS-DC	3.2
Cisco CRS-1 Series Fabric Card Chassis Switch Fabric Card	CRS-FCC-SFC=	3.2

Table 3 Cisco CRS Supported Hardware and Minimum Software Requirements (continued)

Component	Part Number	Support from Version
CRS-1 Fabric Chassis Integrated Switch Controller Card	CRS-FCC-SC-22GE Integrated Switch	3.4.1
Cisco CRS General Chassis Hardware		
Cisco CRS PCMCIA Flash Disk 4 GB	CRS-FLASH-DISK-4G	3.8
Cisco CRS Modular Services Card	CRS-MSC	3.2
Cisco CRS Modular Service Card B	CRS-MSC-B	3.6
Cisco CRS-1 Series Forwarding Processor 40G	CRS-FP40	3.8.1
Cisco CRS Series Modular Services Card 140G	CRS-MSC-140G	4.0.0 PX
Cisco CRS Series Forwarding Processor Card 140G	CRS-FP140	4.0.0 PX
Cisco CRS PCMCIA Flash Disk 16 GB	CRS-FLASH-DISK-16G	4.2
Cisco CRS 8-Slot Fabric Card/Single	CRS-8-FC/S	3.2
Cisco CRS 8-Slot Fabric Card Blank	CRS-8-FC-BLANK	3.2
Cisco CRS 8-Slot Fabric Handle	CRS-8-FC-HANDLE	3.2
Cisco CRS 16-Slot Fabric Card/Single	CRS-16-FC/S	3.2
Cisco CRS Series 4 Slots Fabric Card / Single (140G)	CRS-4-FC140/S	4.0.0 PX
Cisco CRS Series 8 Slots Fabric Card / Single (140G)	CRS-8-FC140/S	4.0.0 PX
Cisco CRS Series 16 Slots Fabric Card / Single (140G)	CRS-16-FC140/S	4.0.0 PX
Cisco CRS Interface and Router Processor Cards		
Cisco CRS 8-Slot Route Processor	CRS-8-RP	3.2
Cisco CRS 8-Slot Route Processor Blank	CRS-8-RP-BLANK	3.2
Cisco CRS 8-Slot Route Processor Handle	CRS-8-RP-HANDLE	3.2
Cisco Carrier 1 Series SPA Interface Processor 40G	CRS1-SIP-800	3.2
Cisco CRS-1 Distributed Route Processor	CRS-DRP	3.3
Cisco CRS-1 Distributed Route Processor CPU Module	CRS-DRP-B-CPU	3.4.1
Cisco CRS-1 Distributed Route Processor PLIM Module	CRS-DRP-B-PLIM	3.4.1
Cisco CRS-1 16-slot Route Processor, revision B	CRS-16-RP-B	3.3
Cisco CRS Series 14x10GbE LAN/WAN-PHY Interface Module	14X10GBE-WL-XFP	4.0.0 PX
Cisco CRS Series 20x10GbE LAN/WAN-PHY Interface Module	20X10GBE-WL-XFP	4.0.0 PX
Cisco CRS 1-port 100-GE CFP PLIM	1x100-GE CFP PLIM	4.0.1 PX
Cisco CRS-1 Series 8 Slots 6 Gb Performance Route Processor	CRS-8-PRP-6G	4.1
Cisco CRS-1 Series 8 Slots 12 Gb Performance Route Processor	CRS-8-PRP-12G	4.1
Cisco CRS-1 Series 16 Slots 6 Gb Performance Route Processor	CRS-16-PRP-6G	4.1
Cisco CRS-1 Series 16 Slots 12 Gb Performance Route Processor	CRS-16-PRP-12G	4.1
Cisco CRS SONET Interface Modules and SPAs		
Cisco CRS 4xOC-192c/STM64c POS/DPT Interface Module/VS	4OC192-POS/DPT-VS	3.2
Cisco CRS 4xOC-192c/STM64c POS/DPT Interface Module/SR	4OC192-POS/DPT-SR	3.2
Cisco CRS 4xOC-192c/STM64c POS/DPT Interface Module/IR	4OC192-POS/DPT-IR	3.2

Table 3 Cisco CRS Supported Hardware and Minimum Software Requirements (continued)

Component	Part Number	Support from Version
Cisco CRS 4xOC-192c/STM64c POS/DPT Interface Module/LR	4OC192-POS/DPT-LR	3.2
Cisco CRS 16xOC-48c/STM16c POS/DPT Interface Module	16OC48-POS/DPT	3.2
Cisco CRS 1xOC-768c/STM256c POS Interface Module/SR	1OC768-POS-SR	3.2
Cisco CRS 8-Port OC-12c/STM-4c Shared Port Adapter	SPA-8XOC12-POS	3.3
Cisco CRS 2-Port OC-48c/STM-16c POS/RPR Shared Port Adapter	SPA-2XOC48-POS/RPR	3.4
Cisco CRS 4-Port OC-48c/STM-16c POS/RPR Shared Port Adapter	SPA-4XOC48-POS/RPR	3.4
Cisco CRS 1-Port OC-192c/STM-64c POS/RPR Shared Port Adapter with XFP Optics	SPA-OC192POS-XFP	3.2
Cisco CRS 4-Port OC-3c/STM-1c Shared Port Adapter	SPA-4XOC3-POS	3.2
Cisco CRS 1-Port OC-192/STM-64 POS/RPR SPA VSR Optics	SPA-OC192POS-VSR	3.4.1
Cisco CRS 1-Port OC-768c/STM-256c (C-band) DWDM PLIM	1OC768-ITU/C	3.3
Cisco CRS 1-Port OC-768c/STM-256c (C-band) DPSK+ DWDM PLIM	1OC768-DPSK/C	3.6
Cisco CRS ATM Modules and SPAs		
3-Port Clear Channel OC-3 ATM SPA	SPA-3XOC3-ATM-V2	3.7
1-Port Clear Channel OC-12 ATM SPA	SPA-1XOC12-ATM-V2	3.7
Cisco CRS Serial Interface Modules and SPAs		
Cisco CRS 4-Port Clear Channel T3/E3 Serial Shared Port Adapter	SPA-4XT3/E3	3.4.1
Cisco CRS 2-Port Clear Channel T3/E3 Serial Shared Port Adapter	SPA-2XT3/E3	3.4.1
Cisco CRS Ethernet Interface Modules and SPAs		
Cisco CRS 8x10 GbE Interface Module LR/ER	8-10GBE	3.2
Cisco 5-Port Gigabit Ethernet Shared Port Adapter, Version 2	SPA-5X1GE-V2	3.4
Cisco 8-Port Gigabit Ethernet Shared Port Adapter, Version 2	SPA-8X1GE-V2	3.4
Cisco 8-Port Gigabit Ethernet Shared Port Adapter	SPA-8X1GE	3.2
Cisco 10-Port Gigabit Ethernet Shared Port Adapter, Version 2	SPA-10X1GE-V2	3.4
Cisco 1-Port Ten Gigabit Ethernet Shared Port Adapter, Version 2	SPA-1X10GE-L-V2	3.4
Cisco 4-Port Ten Gigabit Ethernet (C-band) DWDM PLIM	4-10GE-ITU/C	3.3
Cisco 1-port 10GbE SPA WAN/LAN PHY	SPA-1X10GE-WL-V2	3.5.2
Cisco CRS-1 Series 4x10GE Interface Module	4-10GE	3.8.1
Cisco CRS-1 Series 42x1GE Interface Module	42-1GE	3.8.1
Cisco CRS-1 Series 8-Port Ten Gigabit Ethernet Interface Module	8-10GBE-WL-XFP	3.9.1
Cisco CRS-1 Series 4-Port Ten Gigabit Ethernet Interface Module	4-10GBE-WL-XFP	3.8.4
Cisco CRS-1 Series 20x1GE Flexible Interface Module	20-1GE-FLEX	3.8.1
Cisco CRS-1 Series 2x10GE WAN/LAN Flexible Interface Module	2-10GE-WL-FLEX	3.8.1
Cisco CRS 10GE Optical to Electrical Modules		

Table 3 Cisco CRS Supported Hardware and Minimum Software Requirements (continued)

Component	Part Number	Support from Version
10GBASE-LR XENPAK Module for Cisco CRS	XENPAK-10GB-LR+	3.4
10GBASE-DWDM XENPAK	XENPAK-10GB-DWDM	3.2.2
10GBASE-ER XENPAK Modular for Cisco CRS-1	XENPAK-10GB-ER	3.4
10GBASE-ER XENPAK Modular for Cisco CRS-1	XENPAK-10GB-ER+	3.4
Cisco 10GBASE-SR XFP Module for MMF	XFP-10G-MM-SR	3.8
Cisco Multirate 10GBASE-LR/-LW and OC-192/STM-64 SR-1 XFP Module for SMF	XFP-10GLR-OC192SR	3.4
Cisco Multirate 10GBASE-LR/-LW and OC-192/STM-64 SR-1 XFP Module for SMF, low power (1.5W)	XFP10GLR-192SR-L	3.8.4, 3.9.1
Cisco Multirate 10GBASE-ER/-EW and OC-192/STM-64 IR-2 XFP Module for SMF	XFP-10GER-192IR+	3.4
Cisco Multirate 10GBASE-ER/-EW and OC-192/STM-64 IR-2 XFP Module for SMF, low power (2.5W)	XFP10GER-192IR-L	3.8.4, 3.9.1
Cisco Multirate 10GBASE-ZR/-ZW and OC-192/STM-64 lR-2 XFP Module for SMF	XFP-10GZR-OC192LR	3.4
Cisco CRS SFPs		
Cisco CRS 2.5 G SFP LR Optic	POM-OC48-LR2-LC-C	3.2
Cisco CRS 2.5 G SFP SR Optic	POM-OC48-SR-LC-C	3.2
GE SFP, LC connector LX/LH transceiver	GLC-LH-SM	3.2
1000BASE-SX SFP transceiver module, MMF, 850nm, DOM	GLC-SX-MMD	3.6
1000BASE-LX/LH SFP transceiver module, MMF/SMF, 1310nm, DOM	GLC-LH-SMD	3.6
1000BASE-LX/LH SFP	SFP-GE-L	3.4
1000BASE-SX SFP (DOM)	SFP-GE-S	3.4
1000BASE-T SFP (NEBS 3 ESD)	SFP-GE-T	3.4
1000BASE-ZX Gigabit Ethernet SFP (DOM)	SFP-GE-Z	3.4

Hardware Not Supported

The following hardware is not supported in Cisco IOS XR Release 4.2:

Component	Part Number
Cisco CRS-1 16-Slot Line-Card Chassis Route Processor	CRS-16-RP
Cisco CRS PCMCIA Flash Disk 2 GB	CRS-FLASH-DISK-2G

Note RP-B with CRS-3 is not supported for Multi-chassis systems; only PRP is supported for such systems. Cisco highly recommends PRP for all CRS-1, CRS-3 Single-chassis and Multi-chassis configurations, due to its significant advantages in improving boot time, performance, and scale.

For information on End-of-Sale and End-of-Life Announcement for the Cisco CRS 8-Slot and 16-slot Line Card Chassis Route Processors:
http://www.cisco.com/en/US/partner/prod/collateral/routers/ps5763/end_of_life_notice_c51-695816.html
http://www.cisco.com/en/US/partner/prod/collateral/routers/ps5763/end_of_life_notice_c51-695817.html

Note Cisco Session Border Controller (SBC) is not supported on any platform in Cisco IOS XR Software Release 4.2. Cisco IOS XR Software Release 3.7 is the last release that supports SBC.

CRS FP-140 Licenses

The following licenses apply to the CRS FP-140:

Licence	Description
XC-ENH-NF-140G	Cisco CRS Series Enhanced Netflow Performance License 140G
XC-L2L3VPN-140G	Cisco CRS Series L2 and L3 VPN Peering Edge License 140G
XC-RTE-SCL-140G	Cisco CRS Series Route Scale License 140G
XC-TE-SCL-140G	Cisco CRS Series Traffic Engineering Scale License 140G
XC-MC-LIC-140G	Cisco CRS Series Multishelf License 140G

Software Compatibility

Cisco IOS XR Software Release 4.2 is compatible with the following Cisco CRS-1 systems:

- Cisco CRS 4-Slot Line Card Chassis
- Cisco CRS 8-Slot Line Card Chassis
- Cisco CRS 16-Slot Line Card Chassis
- Cisco CRS Multishelf Systems

Cisco IOS XR Software Release 4.2 is compatible with the following Cisco CRS-3 systems:

- Cisco CRS 4-Slot Line Card Chassis
- Cisco CRS 8-Slot Line Card Chassis
- Cisco CRS 16-Slot Line Card Chassis

Other Firmware Support

The Cisco CRS supports the following firmware code:

- The minimum ROMMON version required for this release is 2.06. For more information about ROMMON specifications, see http://www.cisco.com/web/Cisco_IOS_XR_Software/index.html. For information about upgrading the ROMMON, refer to the *Cisco IOS XR ROM Monitor Guide for*

the Cisco CRS Router at:
http://www.cisco.com/en/US/products/ps5763/products_installation_and_configuration_guides_list.html

- If the FPDs need an upgrade or a downgrade, use the **admin upgrade hw-module fpd** command.
- At least one FPD is running the minimum supported software version. To upgrade this FPD, use the **admin upgrade hw-module fpd force**.

Check the firmware needed by running the **show fpd package** command in admin mode.

Cisco CRS-1 show fpd package Output

```
RP/0/RP1/CPU0:router(admin)#sh fpd package

================================ ============================================
                                        Field Programmable Device Package
                                 ============================================
                                                                    SW      Min Req   Min Req
Card Type            FPD Description            Type Subtype    Version   SW Ver    HW Vers
==================== ========================== ==== ======= =========== ======== ========
S2                   FPGA 4.02                  lc   fpga2        4.02       0.00      0.0
                     FPGA 5.00                  lc   fpga3        5.00       0.00      0.0
                     FPGA 6.04 spb              lc   fpga1        6.04       0.00      0.0
                     ROMMONA swv2.06 spb        lc   rommonA      2.06       2.05      0.0
                     ROMMONB swv2.06 spb        lc   rommon       2.06       2.06      0.0
-------------------------------------------------------------------------------------------
140G-S1S2S3          FPGA 4.01                  lc   fpga2        4.01       0.00      0.0
                     FPGA 6.04 spb              lc   fpga1        6.04       0.00      0.0
                     ROMMONA swv2.06 spb        lc   rommonA      2.06       2.05      0.0
                     ROMMONB swv2.06 spb        lc   rommon       2.06       2.06      0.0
-------------------------------------------------------------------------------------------
Fabric HS123 Superst FPGA 4.00                  lc   fpga2        4.00       0.00      0.0
                     FPGA 6.04 spb              lc   fpga1        6.04       0.00      0.0
                     ROMMONA swv2.06 spb        lc   rommonA      2.06       2.05      0.0
                     ROMMONB swv2.06 spb        lc   rommon       2.06       2.06      0.0
-------------------------------------------------------------------------------------------
140G-4-S1S2S3        FPGA 4.01                  lc   fpga2        4.01       0.00      0.0
                     FPGA 6.04 spb              lc   fpga1        6.04       0.00      0.0
                     ROMMONA swv2.06 spb        lc   rommonA      2.06       2.05      0.0
                     ROMMONB swv2.06 spb        lc   rommon       2.06       2.06      0.0
-------------------------------------------------------------------------------------------
140G-S1S3            FPGA 4.01                  lc   fpga2        4.01       0.00      0.0
                     FPGA 6.04 spb              lc   fpga1        6.04       0.00      0.0
                     ROMMONA swv2.06 spb        lc   rommonA      2.06       2.05      0.0
                     ROMMONB swv2.06 spb        lc   rommon       2.06       2.06      0.0
-------------------------------------------------------------------------------------------
140G-S1S2S3-2        FPGA 4.01                  lc   fpga2        4.01       0.00      0.0
                     FPGA 6.04 spb              lc   fpga1        6.04       0.00      0.0
                     ROMMONA swv2.06 spb        lc   rommonA      2.06       2.05      0.0
                     ROMMONB swv2.06 spb        lc   rommon       2.06       2.06      0.0
-------------------------------------------------------------------------------------------
140G-S1S3-2          FPGA 4.01                  lc   fpga2        4.01       0.00      0.0
                     FPGA 6.04 spb              lc   fpga1        6.04       0.00      0.0
                     ROMMONA swv2.06 spb        lc   rommonA      2.06       2.05      0.0
                     ROMMONB swv2.06 spb        lc   rommon       2.06       2.06      0.0
-------------------------------------------------------------------------------------------
140G-S2-2            FPGA 4.02                  lc   fpga2        4.02       0.00      0.0
                     FPGA 16.00                 lc   fpga3       16.00       0.00      0.0
                     FPGA 6.04 spb              lc   fpga1        6.04       0.00      0.0
                     ROMMONA swv2.06 spb        lc   rommonA      2.06       2.05      0.0
                     ROMMONB swv2.06 spb        lc   rommon       2.06       2.06      0.0
-------------------------------------------------------------------------------------------
140G-MSC             FPGA Linecard 0.36         lc   fpga2        0.36       0.00      0.0
```

```
                    FPGA CPU 0.8              lc   fpga1       0.08        0.00      0.0
                    ROMMONA swv2.06 kensho    lc   rommonA     2.06        2.04      0.0
                    ROMMONB swv2.06 kensho    lc   rommon      2.06        2.06      0.0
--------------------------------------------------------------------------------------
FP-140G             FPGA Linecard 0.36        lc   fpga2       0.36        0.00      0.0
                    FPGA CPU 0.8              lc   fpga1       0.08        0.00      0.0
                    ROMMONA swv2.06 kensho    lc   rommonA     2.06        2.04      0.0
                    ROMMONB swv2.06 kensho    lc   rommon      2.06        2.06      0.0
--------------------------------------------------------------------------------------
CRS-LSP             FPGA Linecard 0.36        lc   fpga2       0.36        0.00      0.0
                    FPGA CPU 0.8              lc   fpga1       0.08        0.00      0.0
                    ROMMONA swv2.06 kensho    lc   rommonA     2.06        2.04      0.0
                    ROMMONB swv2.06 kensho    lc   rommon      2.06        2.06      0.0
--------------------------------------------------------------------------------------
1OC768-ITU/C        OPTICS FIRMWARE 110B10    lc   fpga2     110.10        0.00      0.0
--------------------------------------------------------------------------------------
1OC768-DWDM-L       OPTICS FIRMWARE 110B10    lc   fpga2     110.10        0.00      0.0
--------------------------------------------------------------------------------------
1OC768-DPSK/C       OPTICS FIRMWARE 110B14    lc   fpga2     110.14        0.00      0.0
--------------------------------------------------------------------------------------
1OC768-DPSK/C-O     OPTICS FIRMWARE 110B14    lc   fpga2     110.14        0.00      0.0
--------------------------------------------------------------------------------------
1OC768-DPSK/C-E     OPTICS FIRMWARE 110B14    lc   fpga2     110.14        0.00      0.0
--------------------------------------------------------------------------------------
CRS-CGSE-PLIM       FPGA mCPU0 0.559          lc   fpga2      0.559        0.00      0.0
                    FPGA sCPU0 0.559          lc   fpga3      0.559        0.00      0.0
                    FPGA mCPU1 0.559          lc   fpga4      0.559        0.00      0.0
                    FPGA sCPU1 0.559          lc   fpga5      0.559        0.00      0.0
                    FPGA PLIM_SVC 0.41014     lc   fpga1      0.41014      0.00      0.0
--------------------------------------------------------------------------------------
20-10GBE            PLIM FPGA 42.0            lc   fpga3     42.00        0.00      0.0
--------------------------------------------------------------------------------------
12-10GBE            PLIM FPGA 42.0            lc   fpga3     42.00        0.00      0.0
--------------------------------------------------------------------------------------
1-100GBE            PLIM FPGA 19.0            lc   fpga3     19.00        0.00      0.0
                    RX MAC FPGA 49.0          lc   fpga4     49.00        0.00      0.0
                    TX MAC FPGA 34.0          lc   fpga5     34.00        0.00      0.0
--------------------------------------------------------------------------------------
14-10GBE            PLIM FPGA 42.0            lc   fpga3     42.00        0.00      0.0
--------------------------------------------------------------------------------------
DRP_B               FPGA 6.04 spb             lc   fpga1      6.04        0.00      0.0
                    ROMMONA swv2.06 asmp      lc   rommonA    2.06        2.01      0.0
                    ROMMONA swv2.06 dsmp      lc   rommonA    2.06        2.01      0.0
                    ROMMONA swv2.06 sp        lc   rommonA    2.06        2.01      0.0
                    ROMMONA swv2.06 spb       lc   rommonA    2.06        2.05      0.0
                    ROMMONB swv2.06 asmp      lc   rommon     2.06        2.06      0.0
                    ROMMONB swv2.06 dsmp      lc   rommon     2.06        2.06      0.0
                    ROMMONB swv2.06 sp        lc   rommon     2.06        2.06      0.0
                    ROMMONB swv2.06 spb       lc   rommon     2.06        2.06      0.0
--------------------------------------------------------------------------------------
MSC_B               FPGA 6.04 spb             lc   fpga1      6.04        0.00      0.0
                    ROMMONA swv2.06 asmp      lc   rommonA    2.06        2.01      0.0
                    ROMMONA swv2.06 dsmp      lc   rommonA    2.06        2.01      0.0
                    ROMMONA swv2.06 sp        lc   rommonA    2.06        2.01      0.0
                    ROMMONA swv2.06 spb       lc   rommonA    2.06        2.05      0.0
                    ROMMONB swv2.06 asmp      lc   rommon     2.06        2.06      0.0
                    ROMMONB swv2.06 dsmp      lc   rommon     2.06        2.06      0.0
                    ROMMONB swv2.06 sp        lc   rommon     2.06        2.06      0.0
                    ROMMONB swv2.06 spb       lc   rommon     2.06        2.06      0.0
--------------------------------------------------------------------------------------
FP40                FPGA 6.04 spb             lc   fpga1      6.04        0.00      0.0
                    ROMMONA swv2.06 asmp      lc   rommonA    2.06        2.01      0.0
                    ROMMONA swv2.06 dsmp      lc   rommonA    2.06        2.01      0.0
                    ROMMONA swv2.06 sp        lc   rommonA    2.06        2.01      0.0
```

```
                    ROMMONA swv2.06 spb       lc   rommonA     2.06        2.05      0.0
                    ROMMONB swv2.06 asmp      lc   rommon      2.06        2.06      0.0
                    ROMMONB swv2.06 dsmp      lc   rommon      2.06        2.06      0.0
                    ROMMONB swv2.06 sp        lc   rommon      2.06        2.06      0.0
                    ROMMONB swv2.06 spb       lc   rommon      2.06        2.06      0.0
-------------------------------------------------------------------------------------------
CRS1-SIP-800        JACKET FPGA swv6.0        lc   fpga1       6.00        5.00      0.0
                    FPGA swv6.0 hwv80         lc   fpga1       6.00        5.00
0.80
-------------------------------------------------------------------------------------------
8-10GBE             FPGA swvA.0               lc   fpga1      10.00        0.00      0.0
-------------------------------------------------------------------------------------------
OC48-POS-16-ED      FPGA PLIM_OC48 9.0        lc   fpga1       9.00        0.00      0.0
-------------------------------------------------------------------------------------------
4-10GBE             FPGA sw_4p_v15.0          lc   fpga1      15.00        0.00      0.0
-------------------------------------------------------------------------------------------
8-10GBE             FPGA sw_8p_v15.0          lc   fpga1      15.00        0.00      0.0
-------------------------------------------------------------------------------------------
4-10GE              SQUIRREL FPGA 10.0        lc   fpga1      10.00        0.00      0.0
-------------------------------------------------------------------------------------------
42-1GE              FPGA swv6.0               lc   fpga1       6.00        0.00      0.0
                    FPGA swv6.0 hwv0.80       lc   fpga1       6.00        0.00     0.80
-------------------------------------------------------------------------------------------
20-1GE-FLEX         FPGA swv6.0               lc   fpga1       6.00        0.00      0.0
                    FPGA swv6.0 hwv0.80       lc   fpga1       6.00        0.00     0.80
-------------------------------------------------------------------------------------------
2-10GE-WL-FLEX      FPGA swv6.0               lc   fpga1       6.00        0.00      0.0
                    FPGA swv6.0 hwv0.80       lc   fpga1       6.00        0.00     0.80
-------------------------------------------------------------------------------------------
CRS-16-ALARM-C      FPGA 6.04 spb             lc   fpga1       6.04        0.00      0.0
                    ROMMONA swv2.06 sp        lc   rommonA     2.06        2.01      0.0
                    ROMMONA swv2.06 spb       lc   rommonA     2.06        2.05      0.0
                    ROMMONB swv2.06 sp        lc   rommon      2.06        2.06      0.0
                    ROMMONB swv2.06 spb       lc   rommon      2.06        2.06      0.0
-------------------------------------------------------------------------------------------
CRS-16-ALARM-B      FPGA 6.04 spb             lc   fpga1       6.04        0.00      0.0
                    ROMMONA swv2.06 spb       lc   rommonA     2.06        2.05      0.0
                    ROMMONB swv2.06 spb       lc   rommon      2.06        2.06      0.0
-------------------------------------------------------------------------------------------
CRS-16-FAN-CT       FPGA 6.04 spb             lc   fpga1       6.04        0.00      0.0
                    ROMMONA swv2.06 spb       lc   rommonA     2.06        2.05      0.0
                    ROMMONB swv2.06 spb       lc   rommon      2.06        2.06      0.0
-------------------------------------------------------------------------------------------
CRS-16-LCC-F-CT-B   FPGA 6.04 spb             lc   fpga1       6.04        0.00      0.0
                    ROMMONA swv2.06 spb       lc   rommonA     2.06        2.05      0.0
                    ROMMONB swv2.06 spb       lc   rommon      2.06        2.06      0.0
-------------------------------------------------------------------------------------------
CRS-FCC-LED         FPGA 6.04 spb             lc   fpga1       6.04        0.00      0.0
                    ROMMONA swv2.06 sp        lc   rommonA     2.06        2.01      0.0
                    ROMMONA swv2.06 spb       lc   rommonA     2.06        2.05      0.0
                    ROMMONB swv2.06 sp        lc   rommon      2.06        2.06      0.0
                    ROMMONB swv2.06 spb       lc   rommon      2.06        2.06      0.0
-------------------------------------------------------------------------------------------
Route Processor     ROMMONA swv2.06 asmp      lc   rommonA     2.06        2.01      0.0
                    ROMMONA swv2.06 dsmp      lc   rommonA     2.06        2.01      0.0
                    ROMMONB swv2.06 asmp      lc   rommon      2.06        2.06      0.0
                    ROMMONB swv2.06 dsmp      lc   rommon      2.06        2.06      0.0
-------------------------------------------------------------------------------------------
SC                  ROMMONA swv2.06 asmp      lc   rommonA     2.06        2.01      0.0
                    ROMMONA swv2.06 dsmp      lc   rommonA     2.06        2.01      0.0
                    ROMMONB swv2.06 asmp      lc   rommon      2.06        2.06      0.0
                    ROMMONB swv2.06 dsmp      lc   rommon      2.06        2.06      0.0
-------------------------------------------------------------------------------------------
RP                  ROMMONA swv2.06 asmp      lc   rommonA     2.06        2.01      0.0
```

```
                    ROMMONA swv2.06 dsmp       lc   rommonA     2.06        2.01      0.0
                    ROMMONB swv2.06 asmp       lc   rommon      2.06        2.06      0.0
                    ROMMONB swv2.06 dsmp       lc   rommon      2.06        2.06      0.0
--------------------------------------------------------------------------------------------
Shelf Controller GE ROMMONA swv2.06 asmp       lc   rommonA     2.06        2.01      0.0
                    ROMMONA swv2.06 dsmp       lc   rommonA     2.06        2.01      0.0
                    ROMMONB swv2.06 asmp       lc   rommon      2.06        2.06      0.0
                    ROMMONB swv2.06 dsmp       lc   rommon      2.06        2.06      0.0
--------------------------------------------------------------------------------------------
RP                  ROMMONA swv2.06 asmp       lc   rommonA     2.06        2.01      0.0
                    ROMMONA swv2.06 dsmp       lc   rommonA     2.06        2.01      0.0
                    ROMMONB swv2.06 asmp       lc   rommon      2.06        2.06      0.0
                    ROMMONB swv2.06 dsmp       lc   rommon      2.06        2.06      0.0
--------------------------------------------------------------------------------------------
Shelf Controller GE2 ROMMONA swv2.06 asmp      lc   rommonA     2.06        2.01      0.0
                    ROMMONA swv2.06 dsmp       lc   rommonA     2.06        2.01      0.0
                    ROMMONB swv2.06 asmp       lc   rommon      2.06        2.06      0.0
                    ROMMONB swv2.06 dsmp       lc   rommon      2.06        2.06      0.0
--------------------------------------------------------------------------------------------
DRP                 ROMMONA swv2.06 asmp       lc   rommonA     2.06        2.01      0.0
                    ROMMONA swv2.06 dsmp       lc   rommonA     2.06        2.01      0.0
                    ROMMONA swv2.06 sp         lc   rommonA     2.06        2.01      0.0
                    ROMMONB swv2.06 asmp       lc   rommon      2.06        2.06      0.0
                    ROMMONB swv2.06 dsmp       lc   rommon      2.06        2.06      0.0
                    ROMMONB swv2.06 sp         lc   rommon      2.06        2.06      0.0
--------------------------------------------------------------------------------------------
S1S2S3              ROMMONA swv2.06 sp         lc   rommonA     2.06        2.01      0.0
                    ROMMONB swv2.06 sp         lc   rommon      2.06        2.06      0.0
--------------------------------------------------------------------------------------------
S1S3                ROMMONA swv2.06 sp         lc   rommonA     2.06        2.01      0.0
                    ROMMONB swv2.06 sp         lc   rommon      2.06        2.06      0.0
--------------------------------------------------------------------------------------------
S2                  ROMMONA swv2.06 sp         lc   rommonA     2.06        2.01      0.0
                    ROMMONB swv2.06 sp         lc   rommon      2.06        2.06      0.0
--------------------------------------------------------------------------------------------
Fabric HS123        ROMMONA swv2.06 sp         lc   rommonA     2.06        2.01      0.0
                    ROMMONB swv2.06 sp         lc   rommon      2.06        2.06      0.0
--------------------------------------------------------------------------------------------
Fabric QQS123       ROMMONA swv2.06 sp         lc   rommonA     2.06        2.01      0.0
                    ROMMONB swv2.06 sp         lc   rommon      2.06        2.06      0.0
--------------------------------------------------------------------------------------------
LED                 ROMMONA swv2.06 sp         lc   rommonA     2.06        2.01      0.0
                    ROMMONB swv2.06 sp         lc   rommon      2.06        2.06      0.0
--------------------------------------------------------------------------------------------
40G-MSC             ROMMONA swv2.06 asmp       lc   rommonA     2.06        2.01      0.0
                    ROMMONA swv2.06 dsmp       lc   rommonA     2.06        2.01      0.0
                    ROMMONA swv2.06 sp         lc   rommonA     2.06        2.01      0.0
                    ROMMONB swv2.06 asmp       lc   rommon      2.06        2.06      0.0
                    ROMMONB swv2.06 dsmp       lc   rommon      2.06        2.06      0.0
                    ROMMONB swv2.06 sp         lc   rommon      2.06        2.06      0.0
--------------------------------------------------------------------------------------------
CRS-16-ALARM        ROMMONA swv2.06 sp         lc   rommonA     2.06        2.01      0.0
                    ROMMONB swv2.06 sp         lc   rommon      2.06        2.06      0.0
--------------------------------------------------------------------------------------------
CRS-16-LCC-FAN-CT   ROMMONA swv2.06 sp         lc   rommonA     2.06        2.01      0.0
                    ROMMONB swv2.06 sp         lc   rommon      2.06        2.06      0.0
--------------------------------------------------------------------------------------------
FC Fan Controller   ROMMONA swv2.06 sp         lc   rommonA     2.06        2.01      0.0
                    ROMMONB swv2.06 sp         lc   rommon      2.06        2.06      0.0
--------------------------------------------------------------------------------------------
SPA-4XT3/E3         SPA E3 Subrate FPGA        spa  fpga2       1.04        0.00      0.0
                    SPA T3 Subrate FPGA        spa  fpga3       1.04        0.00      0.0
                    SPA I/O FPGA               spa  fpga1       1.00        0.00      0.0
                    SPA ROMMON                 spa  rommon      2.12        0.00      0.0
```

```
-------------------------------------------------------------------------------------------
SPA-2XT3/E3          SPA E3 Subrate FPGA        spa  fpga2       1.04         0.00       0.0
                     SPA T3 Subrate FPGA        spa  fpga3       1.04         0.00       0.0
                     SPA I/O FPGA               spa  fpga1       1.00         0.00       0.0
                     SPA ROMMON                 spa  rommon      2.12         0.00       0.0
-------------------------------------------------------------------------------------------
SPA-1XCHOC48/DS3     SPA I/O FPGA               spa  fpga2       1.00         0.00      0.49
                     SPA I/O FPGA               spa  fpga3       1.00         0.00      0.52
                     SPA I/O FPGA               spa  fpga1       1.36         0.00      0.49
                     SPA ROMMON                 spa  rommon      2.02         0.00      0.49
-------------------------------------------------------------------------------------------
SPA-1XCHOC12/DS0     SPA I/O FPGA               spa  fpga2       1.00         0.00      0.49
                     SPA I/O FPGA               spa  fpga1       1.36         0.00      0.49
                     SPA ROMMON                 spa  rommon      2.02         0.00      0.49
-------------------------------------------------------------------------------------------
SPA-OC192POS         SPA FPGA swv1.3            spa  fpga1       1.03         0.00       0.0
-------------------------------------------------------------------------------------------
SPA-8XOC12-POS       SPA FPGA swv1.0            spa  fpga1       1.00         0.00       0.5
-------------------------------------------------------------------------------------------
SPA-4XOC3-POS        SPA FPGA swv3.4            spa  fpga1       3.04         0.00       0.0
-------------------------------------------------------------------------------------------
SPA-OC192POS-XFP     SPA FPGA swv1.2            spa  fpga1       1.02         0.00       0.0
-------------------------------------------------------------------------------------------
SPA-8X1GE            SPA FPGA swv1.8            spa  fpga1       1.08         0.00       0.0
-------------------------------------------------------------------------------------------
SPA-2XOC48POS/RPR    SPA FPGA swv1.0            spa  fpga1       1.00         0.00       0.0
-------------------------------------------------------------------------------------------
SPA-4XOC48POS/RPR    SPA FPGA swv1.0            spa  fpga1       1.00         0.00       0.0
-------------------------------------------------------------------------------------------
SPA-1XOC48POS/RPR    SPA FPGA swv1.2            spa  fpga1       1.02         0.00       0.0
-------------------------------------------------------------------------------------------
SPA-8XOC3-POS        SPA FPGA swv1.0            spa  fpga1       1.00         0.00       0.5
                     SPA FPGA swv1.0            spa  fpga1       1.00         0.00       0.5
-------------------------------------------------------------------------------------------
SPA-2XOC12-POS       SPA FPGA swv1.0            spa  fpga1       1.00         0.00       0.5
-------------------------------------------------------------------------------------------
SPA-4XOC12-POS       SPA FPGA swv1.0            spa  fpga1       1.00         0.00       0.5
-------------------------------------------------------------------------------------------
SPA-10X1GE-V2        SPA FPGA swv1.10           spa  fpga1       1.10         0.00       0.0
-------------------------------------------------------------------------------------------
SPA-8X1GE-V2         SPA FPGA swv1.10           spa  fpga1       1.10         0.00       0.0
-------------------------------------------------------------------------------------------
SPA-5X1GE-V2         SPA FPGA swv1.10           spa  fpga1       1.10         0.00       0.0
-------------------------------------------------------------------------------------------
SPA-1X10GE-L-V2      SPA FPGA swv1.11           spa  fpga1       1.11         0.00       0.0
-------------------------------------------------------------------------------------------
SPA-4XOC3-POS-V2     SPA FPGA swv1.0            spa  fpga1       1.00         0.00       0.5
-------------------------------------------------------------------------------------------
SPA-1X10GE-WL-V2     SPA FPGA swv1.11           spa  fpga1       1.11         0.00       0.0
-------------------------------------------------------------------------------------------
SPA-1XOC3-ATM-V2     SPA FPGA swv1.2            spa  fpga1       2.02         0.00       0.0
-------------------------------------------------------------------------------------------
SPA-2XOC3-ATM-V2     SPA FPGA swv1.2            spa  fpga1       2.02         0.00       0.0
-------------------------------------------------------------------------------------------
SPA-3XOC3-ATM-V2     SPA FPGA swv1.2            spa  fpga1       2.02         0.00       0.0
-------------------------------------------------------------------------------------------
SPA-1XOC12-ATM-V2    SPA FPGA swv1.2            spa  fpga1       2.02         0.00       0.0
-------------------------------------------------------------------------------------------
```

Cisco CRS-3 show fpd package Output

```
RP/0/RP0/CPU0:router(admin)#show fpd package
Thu Dec 22 12:56:46.986 PST
```

Card Type	FPD Description	Type	Subtype	SW Version	Min Req SW Ver	Min Req HW Vers
	Field Programmable Device Package					
PRP	FPGA ZJF uBlaze	lc	fpga2	0.01	0.00	0.0
	S-8 FPGA Nirvana	lc	fpga3	13.00	0.00	0.0
	FPGA BCM 8727	lc	fpga4	0.01	0.00	0.0
	FPGA MCU	lc	fpga5	0.01	0.00	0.0
	S-8 FPGA UTI	lc	fpga6	4.09	0.00	0.0
	FPGA CPU ZJF	lc	fpga1	7.00	0.00	0.0
	ROMMONA swv2.06 x86mp	lc	rommonA	2.06	2.03	0.0
	ROMMONB swv2.06 x86mp	lc	rommon	2.06	2.06	0.0
PRP	FPGA ZJF uBlaze	lc	fpga2	0.01	0.00	0.0
	S-16 FPGA Nirvana	lc	fpga3	13.00	0.00	0.0
	FPGA BCM 8727	lc	fpga4	0.01	0.00	0.0
	FPGA MCU	lc	fpga5	0.01	0.00	0.0
	ZJF FPGA CPU	lc	fpga1	7.00	0.00	0.0
	ROMMONA swv2.06 x86mp	lc	rommonA	2.06	2.03	0.0
	ROMMONB swv2.06 x86mp	lc	rommon	2.06	2.06	0.0
S2	FPGA 4.02	lc	fpga2	4.02	0.00	0.0
	FPGA 5.00	lc	fpga3	5.00	0.00	0.0
	FPGA 6.04 spb	lc	fpga1	6.04	0.00	0.0
	ROMMONA swv2.06 spb	lc	rommonA	2.06	2.05	0.0
	ROMMONB swv2.06 spb	lc	rommon	2.06	2.06	0.0
140G-S1S2S3	FPGA 4.01	lc	fpga2	4.01	0.00	0.0
	FPGA 6.04 spb	lc	fpga1	6.04	0.00	0.0
	ROMMONA swv2.06 spb	lc	rommonA	2.06	2.05	0.0
	ROMMONB swv2.06 spb	lc	rommon	2.06	2.06	0.0
Fabric HS123 Superst	FPGA 4.00	lc	fpga2	4.00	0.00	0.0
	FPGA 6.04 spb	lc	fpga1	6.04	0.00	0.0
	ROMMONA swv2.06 spb	lc	rommonA	2.06	2.05	0.0
	ROMMONB swv2.06 spb	lc	rommon	2.06	2.06	0.0
140G-4-S1S2S3	FPGA 4.01	lc	fpga2	4.01	0.00	0.0
	FPGA 6.04 spb	lc	fpga1	6.04	0.00	0.0
	ROMMONA swv2.06 spb	lc	rommonA	2.06	2.05	0.0
	ROMMONB swv2.06 spb	lc	rommon	2.06	2.06	0.0
140G-S1S3	FPGA 4.01	lc	fpga2	4.01	0.00	0.0
	FPGA 6.04 spb	lc	fpga1	6.04	0.00	0.0
	ROMMONA swv2.06 spb	lc	rommonA	2.06	2.05	0.0
	ROMMONB swv2.06 spb	lc	rommon	2.06	2.06	0.0
140G-S1S2S3-2	FPGA 4.01	lc	fpga2	4.01	0.00	0.0
	FPGA 6.04 spb	lc	fpga1	6.04	0.00	0.0
	ROMMONA swv2.06 spb	lc	rommonA	2.06	2.05	0.0
	ROMMONB swv2.06 spb	lc	rommon	2.06	2.06	0.0
140G-S1S3-2	FPGA 4.01	lc	fpga2	4.01	0.00	0.0
	FPGA 6.04 spb	lc	fpga1	6.04	0.00	0.0
	ROMMONA swv2.06 spb	lc	rommonA	2.06	2.05	0.0
	ROMMONB swv2.06 spb	lc	rommon	2.06	2.06	0.0
140G-S2-2	FPGA 4.02	lc	fpga2	4.02	0.00	0.0
	FPGA 16.00	lc	fpga3	16.00	0.00	0.0
	FPGA 6.04 spb	lc	fpga1	6.04	0.00	0.0
	ROMMONA swv2.06 spb	lc	rommonA	2.06	2.05	0.0
	ROMMONB swv2.06 spb	lc	rommon	2.06	2.06	0.0

140G-MSC	FPGA Linecard 0.36	lc	fpga2	0.36	0.00	0.0
	FPGA CPU 0.8	lc	fpga1	0.08	0.00	0.0
	ROMMONA swv2.06 kensho	lc	rommonA	2.06	2.04	0.0
	ROMMONB swv2.06 kensho	lc	rommon	2.06	2.06	0.0
FP-140G	FPGA Linecard 0.36	lc	fpga2	0.36	0.00	0.0
	FPGA CPU 0.8	lc	fpga1	0.08	0.00	0.0
	ROMMONA swv2.06 kensho	lc	rommonA	2.06	2.04	0.0
	ROMMONB swv2.06 kensho	lc	rommon	2.06	2.06	0.0
CRS-LSP	FPGA Linecard 0.36	lc	fpga2	0.36	0.00	0.0
	FPGA CPU 0.8	lc	fpga1	0.08	0.00	0.0
	ROMMONA swv2.06 kensho	lc	rommonA	2.06	2.04	0.0
	ROMMONB swv2.06 kensho	lc	rommon	2.06	2.06	0.0
1OC768-ITU/C	OPTICS FIRMWARE 110B10	lc	fpga2	110.10	0.00	0.0
1OC768-DWDM-L	OPTICS FIRMWARE 110B10	lc	fpga2	110.10	0.00	0.0
1OC768-DPSK/C	OPTICS FIRMWARE 110B14	lc	fpga2	110.14	0.00	0.0
1OC768-DPSK/C-O	OPTICS FIRMWARE 110B14	lc	fpga2	110.14	0.00	0.0
1OC768-DPSK/C-E	OPTICS FIRMWARE 110B14	lc	fpga2	110.14	0.00	0.0
CRS-CGSE-PLIM	FPGA mCPU0 0.559	lc	fpga2	0.559	0.00	0.0
	FPGA sCPU0 0.559	lc	fpga3	0.559	0.00	0.0
	FPGA mCPU1 0.559	lc	fpga4	0.559	0.00	0.0
	FPGA sCPU1 0.559	lc	fpga5	0.559	0.00	0.0
	FPGA PLIM_SVC 0.41014	lc	fpga1	0.41014	0.00	0.0
20-10GBE	PLIM FPGA 42.0	lc	fpga3	42.00	0.00	0.0
12-10GBE	PLIM FPGA 42.0	lc	fpga3	42.00	0.00	0.0
1-100GBE	PLIM FPGA 19.0	lc	fpga3	19.00	0.00	0.0
	RX MAC FPGA 49.0	lc	fpga4	49.00	0.00	0.0
	TX MAC FPGA 34.0	lc	fpga5	34.00	0.00	0.0
14-10GBE	PLIM FPGA 42.0	lc	fpga3	42.00	0.00	0.0
DRP_B	FPGA 6.04 spb	lc	fpga1	6.04	0.00	0.0
	ROMMONA swv2.06 asmp	lc	rommonA	2.06	2.01	0.0
	ROMMONA swv2.06 dsmp	lc	rommonA	2.06	2.01	0.0
	ROMMONA swv2.06 sp	lc	rommonA	2.06	2.01	0.0
	ROMMONA swv2.06 spb	lc	rommonA	2.06	2.05	0.0
	ROMMONB swv2.06 asmp	lc	rommon	2.06	2.06	0.0
	ROMMONB swv2.06 dsmp	lc	rommon	2.06	2.06	0.0
	ROMMONB swv2.06 sp	lc	rommon	2.06	2.06	0.0
	ROMMONB swv2.06 spb	lc	rommon	2.06	2.06	0.0
MSC_B	FPGA 6.04 spb	lc	fpga1	6.04	0.00	0.0
	ROMMONA swv2.06 asmp	lc	rommonA	2.06	2.01	0.0
	ROMMONA swv2.06 dsmp	lc	rommonA	2.06	2.01	0.0
	ROMMONA swv2.06 sp	lc	rommonA	2.06	2.01	0.0
	ROMMONA swv2.06 spb	lc	rommonA	2.06	2.05	0.0
	ROMMONB swv2.06 asmp	lc	rommon	2.06	2.06	0.0
	ROMMONB swv2.06 dsmp	lc	rommon	2.06	2.06	0.0
	ROMMONB swv2.06 sp	lc	rommon	2.06	2.06	0.0
	ROMMONB swv2.06 spb	lc	rommon	2.06	2.06	0.0
FP40	FPGA 6.04 spb	lc	fpga1	6.04	0.00	0.0
	ROMMONA swv2.06 asmp	lc	rommonA	2.06	2.01	0.0

```
                    ROMMONA swv2.06 dsmp       lc   rommonA     2.06        2.01       0.0
                    ROMMONA swv2.06 sp         lc   rommonA     2.06        2.01       0.0
                    ROMMONA swv2.06 spb        lc   rommonA     2.06        2.05       0.0
                    ROMMONB swv2.06 asmp       lc   rommon      2.06        2.06       0.0
                    ROMMONB swv2.06 dsmp       lc   rommon      2.06        2.06       0.0
                    ROMMONB swv2.06 sp         lc   rommon      2.06        2.06       0.0
                    ROMMONB swv2.06 spb        lc   rommon      2.06        2.06       0.0
-------------------------------------------------------------------------------------------
CRS1-SIP-800        JACKET FPGA swv6.0         lc   fpga1       6.00        5.00       0.0
                    FPGA swv6.0 hwv80          lc   fpga1       6.00        5.00       0.80
-------------------------------------------------------------------------------------------
8-10GBE             FPGA swvA.0                lc   fpga1      10.00        0.00       0.0
-------------------------------------------------------------------------------------------
OC48-POS-16-ED      FPGA PLIM_OC48 9.0         lc   fpga1       9.00        0.00       0.0
-------------------------------------------------------------------------------------------
4-10GBE             FPGA sw_4p_v15.0           lc   fpga1      15.00        0.00       0.0
-------------------------------------------------------------------------------------------
8-10GBE             FPGA sw_8p_v15.0           lc   fpga1      15.00        0.00       0.0
-------------------------------------------------------------------------------------------
4-10GE              SQUIRREL FPGA 10.0         lc   fpga1      10.00        0.00       0.0
-------------------------------------------------------------------------------------------
42-1GE              FPGA swv6.0                lc   fpga1       6.00        0.00       0.0
                    FPGA swv6.0 hwv0.80        lc   fpga1       6.00        0.00       0.80
-------------------------------------------------------------------------------------------
20-1GE-FLEX         FPGA swv6.0                lc   fpga1       6.00        0.00       0.0
                    FPGA swv6.0 hwv0.80        lc   fpga1       6.00        0.00       0.80
-------------------------------------------------------------------------------------------
2-10GE-WL-FLEX      FPGA swv6.0                lc   fpga1       6.00        0.00       0.0
                    FPGA swv6.0 hwv0.80        lc   fpga1       6.00        0.00       0.80
-------------------------------------------------------------------------------------------
CRS-16-ALARM-C      FPGA 6.04 spb              lc   fpga1       6.04        0.00       0.0
                    ROMMONA swv2.06 sp         lc   rommonA     2.06        2.01       0.0
                    ROMMONA swv2.06 spb        lc   rommonA     2.06        2.05       0.0
                    ROMMONB swv2.06 sp         lc   rommon      2.06        2.06       0.0
                    ROMMONB swv2.06 spb        lc   rommon      2.06        2.06       0.0
-------------------------------------------------------------------------------------------
CRS-16-ALARM-B      FPGA 6.04 spb              lc   fpga1       6.04        0.00       0.0
                    ROMMONA swv2.06 spb        lc   rommonA     2.06        2.05       0.0
                    ROMMONB swv2.06 spb        lc   rommon      2.06        2.06       0.0
-------------------------------------------------------------------------------------------
CRS-16-FAN-CT       FPGA 6.04 spb              lc   fpga1       6.04        0.00       0.0
                    ROMMONA swv2.06 spb        lc   rommonA     2.06        2.05       0.0
                    ROMMONB swv2.06 spb        lc   rommon      2.06        2.06       0.0
-------------------------------------------------------------------------------------------
CRS-16-LCC-F-CT-B   FPGA 6.04 spb              lc   fpga1       6.04        0.00       0.0
                    ROMMONA swv2.06 spb        lc   rommonA     2.06        2.05       0.0
                    ROMMONB swv2.06 spb        lc   rommon      2.06        2.06       0.0
-------------------------------------------------------------------------------------------
CRS-FCC-LED         FPGA 6.04 spb              lc   fpga1       6.04        0.00       0.0
                    ROMMONA swv2.06 sp         lc   rommonA     2.06        2.01       0.0
                    ROMMONA swv2.06 spb        lc   rommonA     2.06        2.05       0.0
                    ROMMONB swv2.06 sp         lc   rommon      2.06        2.06       0.0
                    ROMMONB swv2.06 spb        lc   rommon      2.06        2.06       0.0
-------------------------------------------------------------------------------------------
Route Processor     ROMMONA swv2.06 asmp       lc   rommonA     2.06        2.01       0.0
                    ROMMONA swv2.06 dsmp       lc   rommonA     2.06        2.01       0.0
                    ROMMONB swv2.06 asmp       lc   rommon      2.06        2.06       0.0
                    ROMMONB swv2.06 dsmp       lc   rommon      2.06        2.06       0.0
-------------------------------------------------------------------------------------------
SC                  ROMMONA swv2.06 asmp       lc   rommonA     2.06        2.01       0.0
                    ROMMONA swv2.06 dsmp       lc   rommonA     2.06        2.01       0.0
                    ROMMONB swv2.06 asmp       lc   rommon      2.06        2.06       0.0
                    ROMMONB swv2.06 dsmp       lc   rommon      2.06        2.06       0.0
-------------------------------------------------------------------------------------------
```

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RP                  ROMMONA swv2.06 asmp       lc   rommonA     2.06        2.01      0.0
                    ROMMONA swv2.06 dsmp       lc   rommonA     2.06        2.01      0.0
                    ROMMONB swv2.06 asmp       lc   rommon      2.06        2.06      0.0
                    ROMMONB swv2.06 dsmp       lc   rommon      2.06        2.06      0.0
--------------------------------------------------------------------------------------------
Shelf Controller GE  ROMMONA swv2.06 asmp       lc   rommonA     2.06        2.01      0.0
                    ROMMONA swv2.06 dsmp       lc   rommonA     2.06        2.01      0.0
                    ROMMONB swv2.06 asmp       lc   rommon      2.06        2.06      0.0
                    ROMMONB swv2.06 dsmp       lc   rommon      2.06        2.06      0.0
--------------------------------------------------------------------------------------------
RP                  ROMMONA swv2.06 asmp       lc   rommonA     2.06        2.01      0.0
                    ROMMONA swv2.06 dsmp       lc   rommonA     2.06        2.01      0.0
                    ROMMONB swv2.06 asmp       lc   rommon      2.06        2.06      0.0
                    ROMMONB swv2.06 dsmp       lc   rommon      2.06        2.06      0.0
--------------------------------------------------------------------------------------------
Shelf Controller GE2 ROMMONA swv2.06 asmp       lc   rommonA     2.06        2.01      0.0
                    ROMMONA swv2.06 dsmp       lc   rommonA     2.06        2.01      0.0
                    ROMMONB swv2.06 asmp       lc   rommon      2.06        2.06      0.0
                    ROMMONB swv2.06 dsmp       lc   rommon      2.06        2.06      0.0
--------------------------------------------------------------------------------------------
DRP                 ROMMONA swv2.06 asmp       lc   rommonA     2.06        2.01      0.0
                    ROMMONA swv2.06 dsmp       lc   rommonA     2.06        2.01      0.0
                    ROMMONA swv2.06 sp         lc   rommonA     2.06        2.01      0.0
                    ROMMONB swv2.06 asmp       lc   rommon      2.06        2.06      0.0
                    ROMMONB swv2.06 dsmp       lc   rommon      2.06        2.06      0.0
                    ROMMONB swv2.06 sp         lc   rommon      2.06        2.06      0.0
--------------------------------------------------------------------------------------------
S1S2S3              ROMMONA swv2.06 sp         lc   rommonA     2.06        2.01      0.0
                    ROMMONB swv2.06 sp         lc   rommon      2.06        2.06      0.0
--------------------------------------------------------------------------------------------
S1S3                ROMMONA swv2.06 sp         lc   rommonA     2.06        2.01      0.0
                    ROMMONB swv2.06 sp         lc   rommon      2.06        2.06      0.0
--------------------------------------------------------------------------------------------
S2                  ROMMONA swv2.06 sp         lc   rommonA     2.06        2.01      0.0
                    ROMMONB swv2.06 sp         lc   rommon      2.06        2.06      0.0
--------------------------------------------------------------------------------------------
Fabric HS123         ROMMONA swv2.06 sp         lc   rommonA     2.06        2.01      0.0
                    ROMMONB swv2.06 sp         lc   rommon      2.06        2.06      0.0
--------------------------------------------------------------------------------------------
Fabric QQS123        ROMMONA swv2.06 sp         lc   rommonA     2.06        2.01      0.0
                    ROMMONB swv2.06 sp         lc   rommon      2.06        2.06      0.0
--------------------------------------------------------------------------------------------
LED                 ROMMONA swv2.06 sp         lc   rommonA     2.06        2.01      0.0
                    ROMMONB swv2.06 sp         lc   rommon      2.06        2.06      0.0
--------------------------------------------------------------------------------------------
40G-MSC             ROMMONA swv2.06 asmp       lc   rommonA     2.06        2.01      0.0
                    ROMMONA swv2.06 dsmp       lc   rommonA     2.06        2.01      0.0
                    ROMMONA swv2.06 sp         lc   rommonA     2.06        2.01      0.0
                    ROMMONB swv2.06 asmp       lc   rommon      2.06        2.06      0.0
                    ROMMONB swv2.06 dsmp       lc   rommon      2.06        2.06      0.0
                    ROMMONB swv2.06 sp         lc   rommon      2.06        2.06      0.0
--------------------------------------------------------------------------------------------
CRS-16-ALARM         ROMMONA swv2.06 sp         lc   rommonA     2.06        2.01      0.0
                    ROMMONB swv2.06 sp         lc   rommon      2.06        2.06      0.0
--------------------------------------------------------------------------------------------
CRS-16-LCC-FAN-CT    ROMMONA swv2.06 sp         lc   rommonA     2.06        2.01      0.0
                    ROMMONB swv2.06 sp         lc   rommon      2.06        2.06      0.0
--------------------------------------------------------------------------------------------
FC Fan Controller    ROMMONA swv2.06 sp         lc   rommonA     2.06        2.01      0.0
                    ROMMONB swv2.06 sp         lc   rommon      2.06        2.06      0.0
--------------------------------------------------------------------------------------------
SPA-4XT3/E3          SPA E3 Subrate FPGA        spa  fpga2       1.04        0.00      0.0
                    SPA T3 Subrate FPGA        spa  fpga3       1.04        0.00      0.0
                    SPA I/O FPGA               spa  fpga1       1.00        0.00      0.0
```

	SPA ROMMON	spa	rommon	2.12	0.00	0.0
SPA-2XT3/E3	SPA E3 Subrate FPGA	spa	fpga2	1.04	0.00	0.0
	SPA T3 Subrate FPGA	spa	fpga3	1.04	0.00	0.0
	SPA I/O FPGA	spa	fpga1	1.00	0.00	0.0
	SPA ROMMON	spa	rommon	2.12	0.00	0.0
SPA-1XCHOC48/DS3	SPA I/O FPGA	spa	fpga2	1.00	0.00	0.49
	SPA I/O FPGA	spa	fpga3	1.00	0.00	0.52
	SPA I/O FPGA	spa	fpga1	1.36	0.00	0.49
	SPA ROMMON	spa	rommon	2.02	0.00	0.49
SPA-1XCHOC12/DS0	SPA I/O FPGA	spa	fpga2	1.00	0.00	0.49
	SPA I/O FPGA	spa	fpga1	1.36	0.00	0.49
	SPA ROMMON	spa	rommon	2.02	0.00	0.49
SPA-OC192POS	SPA FPGA swv1.3	spa	fpga1	1.03	0.00	0.0
SPA-8XOC12-POS	SPA FPGA swv1.0	spa	fpga1	1.00	0.00	0.5
SPA-4XOC3-POS	SPA FPGA swv3.4	spa	fpga1	3.04	0.00	0.0
SPA-OC192POS-XFP	SPA FPGA swv1.2	spa	fpga1	1.02	0.00	0.0
SPA-8X1GE	SPA FPGA swv1.8	spa	fpga1	1.08	0.00	0.0
SPA-2XOC48POS/RPR	SPA FPGA swv1.0	spa	fpga1	1.00	0.00	0.0
SPA-4XOC48POS/RPR	SPA FPGA swv1.0	spa	fpga1	1.00	0.00	0.0
SPA-1XOC48POS/RPR	SPA FPGA swv1.2	spa	fpga1	1.02	0.00	0.0
SPA-8XOC3-POS	SPA FPGA swv1.0	spa	fpga1	1.00	0.00	0.5
	SPA FPGA swv1.0	spa	fpga1	1.00	0.00	0.5
SPA-2XOC12-POS	SPA FPGA swv1.0	spa	fpga1	1.00	0.00	0.5
SPA-4XOC12-POS	SPA FPGA swv1.0	spa	fpga1	1.00	0.00	0.5
SPA-10X1GE-V2	SPA FPGA swv1.10	spa	fpga1	1.10	0.00	0.0
SPA-8X1GE-V2	SPA FPGA swv1.10	spa	fpga1	1.10	0.00	0.0
SPA-5X1GE-V2	SPA FPGA swv1.10	spa	fpga1	1.10	0.00	0.0
SPA-1X10GE-L-V2	SPA FPGA swv1.11	spa	fpga1	1.11	0.00	0.0
SPA-4XOC3-POS-V2	SPA FPGA swv1.0	spa	fpga1	1.00	0.00	0.5
SPA-1X10GE-WL-V2	SPA FPGA swv1.11	spa	fpga1	1.11	0.00	0.0
SPA-1XOC3-ATM-V2	SPA FPGA swv1.2	spa	fpga1	2.02	0.00	0.0
SPA-2XOC3-ATM-V2	SPA FPGA swv1.2	spa	fpga1	2.02	0.00	0.0
SPA-3XOC3-ATM-V2	SPA FPGA swv1.2	spa	fpga1	2.02	0.00	0.0
SPA-1XOC12-ATM-V2	SPA FPGA swv1.2	spa	fpga1	2.02	0.00	0.0

Minimum Firmware Requirement

- After completing an RMA remember to upgrade the firmware as per this matrix:

  http://www.cisco.com/web/Cisco_IOS_XR_Software/pdf/SoftwareFirmwareCompatibilityMatrix.pdf

- Links to PDF copies of the IOS XR Firmware Upgrade Guides are available here:

  http://www.cisco.com/web/Cisco_IOS_XR_Software/index.html

  Here's the link to the Cisco Systems IOS XR Firmware Upgrade Guide For CRS-1 and XR12000:

  http://www.cisco.com/web/Cisco_IOS_XR_Software/pdf/IOSXRFirmwareUpgradeGuide.pdf

- Refer to the Hardware Redundancy and Node Administration Commands on Cisco IOS XR Software chapter of the Cisco IOS XR System Management Command Reference for the Cisco CRS router for the upgrade CLI:

  http://www.cisco.com/en/US/docs/routers/crs/software/crs_r4.1/system_management/command/reference/sysman_cr41crs_chapter9.html

Determining Your Software Version

Note P image is discontinued from Cisco IOS XR Software Release 4.2 onwards. For more information about this, see the discontinuation of P image for Cisco CRS in Cisco IOS XR Software Release 4.2 and later at http://www.cisco.com/en/US/prod/collateral/routers/ps5763/product_bulletin_c25-663499.html.

To determine the version of Cisco IOS XR Software running on your router, log into the router and enter the **show version** command:

Cisco CRS show version Output

Step 1 Establish a Telnet session with the router.

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

```
Cisco IOS XR Software, Version 4.2.0[Default]
Copyright (c) 2011 by Cisco Systems, Inc.

ROM: System Bootstrap, Version 2.06(20110916:204056) [CRS ROMMON],

Router uptime is 23 hours, 54 minutes
System image file is "bootflash:disk0/hfr-os-mbi-4.2.0/mbihfr-rp.vm"

cisco CRS-8/S (7457) processor with 4194304K bytes of memory.
7457 processor at 1197Mhz, Revision 1.2
Cisco CRS Series 8 Slots Line Card Chassis

2 Management Ethernet
27 SONET/SDH
27 Packet over SONET/SDH
18 TenGigE
1 WANPHY controller(s)
68 GigabitEthernet
1019k bytes of non-volatile configuration memory.
57119M bytes of hard disk.
14119040k bytes of disk0: (Sector size 512 bytes).
14119040k bytes of disk1: (Sector size 512 bytes).

Boot device on node 0/1/CPU0 is mem:
Package active on node 0/1/CPU0:
iosxr-ce, V 4.2.0[00], Cisco Systems, at disk0:iosxr-ce-4.2.0
    Built on Mon Dec 19 10:51:54 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

hfr-ce, V 4.2.0[00], Cisco Systems, at disk0:hfr-ce-4.2.0
    Built on Mon Dec 19 10:51:56 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

iosxr-mpls, V 4.2.0[00], Cisco Systems, at disk0:iosxr-mpls-4.2.0
    Built on Mon Dec 19 10:51:30 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

iosxr-mcast, V 4.2.0[00], Cisco Systems, at disk0:iosxr-mcast-4.2.0
    Built on Mon Dec 19 10:51:41 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

iosxr-routing, V 4.2.0[00], Cisco Systems, at disk0:iosxr-routing-4.2.0
```

```
    Built on Mon Dec 19 10:51:54 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

iosxr-infra, V 4.2.0[00], Cisco Systems, at disk0:iosxr-infra-4.2.0
    Built on Mon Dec 19 10:51:54 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

hfr-fwding, V 4.2.0[00], Cisco Systems, at disk0:hfr-fwding-4.2.0
    Built on Mon Dec 19 10:51:56 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

iosxr-fwding, V 4.2.0[00], Cisco Systems, at disk0:iosxr-fwding-4.2.0
    Built on Mon Dec 19 10:51:54 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

iosxr-diags, V 4.2.0[00], Cisco Systems, at disk0:iosxr-diags-4.2.0
    Built on Mon Dec 19 10:51:54 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

hfr-fpd, V 4.2.0[00], Cisco Systems, at disk0:hfr-fpd-4.2.0
    Built on Mon Dec 19 11:14:32 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

hfr-diags-supp, V 4.2.0[00], Cisco Systems, at disk0:hfr-diags-supp-4.2.0
    Built on Mon Dec 19 11:14:09 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

hfr-mcast-supp, V 4.2.0[00], Cisco Systems, at disk0:hfr-mcast-supp-4.2.0
    Built on Mon Dec 19 10:51:41 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

hfr-base, V 4.2.0[00], Cisco Systems, at disk0:hfr-base-4.2.0
    Built on Mon Dec 19 10:51:54 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

hfr-os-mbi, V 4.2.0[00], Cisco Systems, at disk0:hfr-os-mbi-4.2.0
    Built on Mon Dec 19 10:53:39 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

Boot device on node 0/2/CPU0 is mem:
Package active on node 0/2/CPU0:
iosxr-ce, V 4.2.0[00], Cisco Systems, at disk0:iosxr-ce-4.2.0
    Built on Mon Dec 19 10:51:54 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

hfr-ce, V 4.2.0[00], Cisco Systems, at disk0:hfr-ce-4.2.0
    Built on Mon Dec 19 10:51:56 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

iosxr-mpls, V 4.2.0[00], Cisco Systems, at disk0:iosxr-mpls-4.2.0
    Built on Mon Dec 19 10:51:30 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

iosxr-mcast, V 4.2.0[00], Cisco Systems, at disk0:iosxr-mcast-4.2.0
    Built on Mon Dec 19 10:51:41 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

iosxr-routing, V 4.2.0[00], Cisco Systems, at disk0:iosxr-routing-4.2.0
    Built on Mon Dec 19 10:51:54 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

iosxr-infra, V 4.2.0[00], Cisco Systems, at disk0:iosxr-infra-4.2.0
    Built on Mon Dec 19 10:51:54 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie
```

```
hfr-fwding, V 4.2.0[00], Cisco Systems, at disk0:hfr-fwding-4.2.0
    Built on Mon Dec 19 10:51:56 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

iosxr-fwding, V 4.2.0[00], Cisco Systems, at disk0:iosxr-fwding-4.2.0
    Built on Mon Dec 19 10:51:54 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

iosxr-diags, V 4.2.0[00], Cisco Systems, at disk0:iosxr-diags-4.2.0
    Built on Mon Dec 19 10:51:54 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

hfr-fpd, V 4.2.0[00], Cisco Systems, at disk0:hfr-fpd-4.2.0
    Built on Mon Dec 19 11:14:32 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

hfr-diags-supp, V 4.2.0[00], Cisco Systems, at disk0:hfr-diags-supp-4.2.0
    Built on Mon Dec 19 11:14:09 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

hfr-mcast-supp, V 4.2.0[00], Cisco Systems, at disk0:hfr-mcast-supp-4.2.0
    Built on Mon Dec 19 10:51:41 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

hfr-base, V 4.2.0[00], Cisco Systems, at disk0:hfr-base-4.2.0
    Built on Mon Dec 19 10:51:54 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

hfr-os-mbi, V 4.2.0[00], Cisco Systems, at disk0:hfr-os-mbi-4.2.0
    Built on Mon Dec 19 10:53:39 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

Boot device on node 0/3/CPU0 is mem:
Package active on node 0/3/CPU0:
iosxr-ce, V 4.2.0[00], Cisco Systems, at disk0:iosxr-ce-4.2.0
    Built on Mon Dec 19 10:51:54 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

hfr-ce, V 4.2.0[00], Cisco Systems, at disk0:hfr-ce-4.2.0
    Built on Mon Dec 19 10:51:56 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

iosxr-mpls, V 4.2.0[00], Cisco Systems, at disk0:iosxr-mpls-4.2.0
    Built on Mon Dec 19 10:51:30 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

iosxr-mcast, V 4.2.0[00], Cisco Systems, at disk0:iosxr-mcast-4.2.0
    Built on Mon Dec 19 10:51:41 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

iosxr-routing, V 4.2.0[00], Cisco Systems, at disk0:iosxr-routing-4.2.0
    Built on Mon Dec 19 10:51:54 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

iosxr-infra, V 4.2.0[00], Cisco Systems, at disk0:iosxr-infra-4.2.0
    Built on Mon Dec 19 10:51:54 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

hfr-fwding, V 4.2.0[00], Cisco Systems, at disk0:hfr-fwding-4.2.0
    Built on Mon Dec 19 10:51:56 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

iosxr-fwding, V 4.2.0[00], Cisco Systems, at disk0:iosxr-fwding-4.2.0
```

```
    Built on Mon Dec 19 10:51:54 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

iosxr-diags, V 4.2.0[00], Cisco Systems, at disk0:iosxr-diags-4.2.0
    Built on Mon Dec 19 10:51:54 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

hfr-fpd, V 4.2.0[00], Cisco Systems, at disk0:hfr-fpd-4.2.0
    Built on Mon Dec 19 11:14:32 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

hfr-diags-supp, V 4.2.0[00], Cisco Systems, at disk0:hfr-diags-supp-4.2.0
    Built on Mon Dec 19 11:14:09 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

hfr-mcast-supp, V 4.2.0[00], Cisco Systems, at disk0:hfr-mcast-supp-4.2.0
    Built on Mon Dec 19 10:51:41 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

hfr-base, V 4.2.0[00], Cisco Systems, at disk0:hfr-base-4.2.0
    Built on Mon Dec 19 10:51:54 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

hfr-os-mbi, V 4.2.0[00], Cisco Systems, at disk0:hfr-os-mbi-4.2.0
    Built on Mon Dec 19 10:53:39 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

Boot device on node 0/4/CPU0 is mem:
Package active on node 0/4/CPU0:
iosxr-ce, V 4.2.0[00], Cisco Systems, at disk0:iosxr-ce-4.2.0
    Built on Mon Dec 19 10:51:54 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

hfr-ce, V 4.2.0[00], Cisco Systems, at disk0:hfr-ce-4.2.0
    Built on Mon Dec 19 10:51:56 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

iosxr-mpls, V 4.2.0[00], Cisco Systems, at disk0:iosxr-mpls-4.2.0
    Built on Mon Dec 19 10:51:30 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

iosxr-mcast, V 4.2.0[00], Cisco Systems, at disk0:iosxr-mcast-4.2.0
    Built on Mon Dec 19 10:51:41 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

iosxr-routing, V 4.2.0[00], Cisco Systems, at disk0:iosxr-routing-4.2.0
    Built on Mon Dec 19 10:51:54 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

iosxr-infra, V 4.2.0[00], Cisco Systems, at disk0:iosxr-infra-4.2.0
    Built on Mon Dec 19 10:51:54 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

hfr-fwding, V 4.2.0[00], Cisco Systems, at disk0:hfr-fwding-4.2.0
    Built on Mon Dec 19 10:51:56 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

iosxr-fwding, V 4.2.0[00], Cisco Systems, at disk0:iosxr-fwding-4.2.0
    Built on Mon Dec 19 10:51:54 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

iosxr-diags, V 4.2.0[00], Cisco Systems, at disk0:iosxr-diags-4.2.0
    Built on Mon Dec 19 10:51:54 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie
```

```
hfr-fpd, V 4.2.0[00], Cisco Systems, at disk0:hfr-fpd-4.2.0
    Built on Mon Dec 19 11:14:32 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

hfr-diags-supp, V 4.2.0[00], Cisco Systems, at disk0:hfr-diags-supp-4.2.0
    Built on Mon Dec 19 11:14:09 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

hfr-mcast-supp, V 4.2.0[00], Cisco Systems, at disk0:hfr-mcast-supp-4.2.0
    Built on Mon Dec 19 10:51:41 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

hfr-base, V 4.2.0[00], Cisco Systems, at disk0:hfr-base-4.2.0
    Built on Mon Dec 19 10:51:54 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

hfr-os-mbi, V 4.2.0[00], Cisco Systems, at disk0:hfr-os-mbi-4.2.0
    Built on Mon Dec 19 10:53:39 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

Boot device on node 0/5/CPU0 is mem:
Package active on node 0/5/CPU0:
iosxr-ce, V 4.2.0[00], Cisco Systems, at disk0:iosxr-ce-4.2.0
    Built on Mon Dec 19 10:51:54 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

hfr-ce, V 4.2.0[00], Cisco Systems, at disk0:hfr-ce-4.2.0
    Built on Mon Dec 19 10:51:56 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

iosxr-mpls, V 4.2.0[00], Cisco Systems, at disk0:iosxr-mpls-4.2.0
    Built on Mon Dec 19 10:51:30 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

iosxr-mcast, V 4.2.0[00], Cisco Systems, at disk0:iosxr-mcast-4.2.0
    Built on Mon Dec 19 10:51:41 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

iosxr-routing, V 4.2.0[00], Cisco Systems, at disk0:iosxr-routing-4.2.0
    Built on Mon Dec 19 10:51:54 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

iosxr-infra, V 4.2.0[00], Cisco Systems, at disk0:iosxr-infra-4.2.0
    Built on Mon Dec 19 10:51:54 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

hfr-fwding, V 4.2.0[00], Cisco Systems, at disk0:hfr-fwding-4.2.0
    Built on Mon Dec 19 10:51:56 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

iosxr-fwding, V 4.2.0[00], Cisco Systems, at disk0:iosxr-fwding-4.2.0
    Built on Mon Dec 19 10:51:54 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

iosxr-diags, V 4.2.0[00], Cisco Systems, at disk0:iosxr-diags-4.2.0
    Built on Mon Dec 19 10:51:54 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

hfr-fpd, V 4.2.0[00], Cisco Systems, at disk0:hfr-fpd-4.2.0
    Built on Mon Dec 19 11:14:32 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

hfr-diags-supp, V 4.2.0[00], Cisco Systems, at disk0:hfr-diags-supp-4.2.0
```

```
    Built on Mon Dec 19 11:14:09 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

hfr-mcast-supp, V 4.2.0[00], Cisco Systems, at disk0:hfr-mcast-supp-4.2.0
    Built on Mon Dec 19 10:51:41 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

hfr-base, V 4.2.0[00], Cisco Systems, at disk0:hfr-base-4.2.0
    Built on Mon Dec 19 10:51:54 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

hfr-os-mbi, V 4.2.0[00], Cisco Systems, at disk0:hfr-os-mbi-4.2.0
    Built on Mon Dec 19 10:53:39 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

Boot device on node 0/6/CPU0 is mem:
Package active on node 0/6/CPU0:
iosxr-ce, V 4.2.0[00], Cisco Systems, at disk0:iosxr-ce-4.2.0
    Built on Mon Dec 19 10:51:54 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

hfr-ce, V 4.2.0[00], Cisco Systems, at disk0:hfr-ce-4.2.0
    Built on Mon Dec 19 10:51:56 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

iosxr-mpls, V 4.2.0[00], Cisco Systems, at disk0:iosxr-mpls-4.2.0
    Built on Mon Dec 19 10:51:30 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

iosxr-mcast, V 4.2.0[00], Cisco Systems, at disk0:iosxr-mcast-4.2.0
    Built on Mon Dec 19 10:51:41 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

iosxr-routing, V 4.2.0[00], Cisco Systems, at disk0:iosxr-routing-4.2.0
    Built on Mon Dec 19 10:51:54 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

iosxr-infra, V 4.2.0[00], Cisco Systems, at disk0:iosxr-infra-4.2.0
    Built on Mon Dec 19 10:51:54 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

hfr-fwding, V 4.2.0[00], Cisco Systems, at disk0:hfr-fwding-4.2.0
    Built on Mon Dec 19 10:51:56 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

iosxr-fwding, V 4.2.0[00], Cisco Systems, at disk0:iosxr-fwding-4.2.0
    Built on Mon Dec 19 10:51:54 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

iosxr-diags, V 4.2.0[00], Cisco Systems, at disk0:iosxr-diags-4.2.0
    Built on Mon Dec 19 10:51:54 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

hfr-fpd, V 4.2.0[00], Cisco Systems, at disk0:hfr-fpd-4.2.0
    Built on Mon Dec 19 11:14:32 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

hfr-diags-supp, V 4.2.0[00], Cisco Systems, at disk0:hfr-diags-supp-4.2.0
    Built on Mon Dec 19 11:14:09 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

hfr-mcast-supp, V 4.2.0[00], Cisco Systems, at disk0:hfr-mcast-supp-4.2.0
    Built on Mon Dec 19 10:51:41 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie
```

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hfr-base, V 4.2.0[00], Cisco Systems, at disk0:hfr-base-4.2.0
    Built on Mon Dec 19 10:51:54 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

hfr-os-mbi, V 4.2.0[00], Cisco Systems, at disk0:hfr-os-mbi-4.2.0
    Built on Mon Dec 19 10:53:39 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

Boot device on node 0/7/CPU0 is mem:
Package active on node 0/7/CPU0:
iosxr-ce, V 4.2.0[00], Cisco Systems, at disk0:iosxr-ce-4.2.0
    Built on Mon Dec 19 10:51:54 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

hfr-ce, V 4.2.0[00], Cisco Systems, at disk0:hfr-ce-4.2.0
    Built on Mon Dec 19 10:51:56 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

iosxr-mpls, V 4.2.0[00], Cisco Systems, at disk0:iosxr-mpls-4.2.0
    Built on Mon Dec 19 10:51:30 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

iosxr-mcast, V 4.2.0[00], Cisco Systems, at disk0:iosxr-mcast-4.2.0
    Built on Mon Dec 19 10:51:41 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

iosxr-routing, V 4.2.0[00], Cisco Systems, at disk0:iosxr-routing-4.2.0
    Built on Mon Dec 19 10:51:54 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

iosxr-infra, V 4.2.0[00], Cisco Systems, at disk0:iosxr-infra-4.2.0
    Built on Mon Dec 19 10:51:54 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

hfr-fwding, V 4.2.0[00], Cisco Systems, at disk0:hfr-fwding-4.2.0
    Built on Mon Dec 19 10:51:56 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

iosxr-fwding, V 4.2.0[00], Cisco Systems, at disk0:iosxr-fwding-4.2.0
    Built on Mon Dec 19 10:51:54 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

iosxr-diags, V 4.2.0[00], Cisco Systems, at disk0:iosxr-diags-4.2.0
    Built on Mon Dec 19 10:51:54 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

hfr-fpd, V 4.2.0[00], Cisco Systems, at disk0:hfr-fpd-4.2.0
    Built on Mon Dec 19 11:14:32 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

hfr-diags-supp, V 4.2.0[00], Cisco Systems, at disk0:hfr-diags-supp-4.2.0
    Built on Mon Dec 19 11:14:09 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

hfr-mcast-supp, V 4.2.0[00], Cisco Systems, at disk0:hfr-mcast-supp-4.2.0
    Built on Mon Dec 19 10:51:41 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

hfr-base, V 4.2.0[00], Cisco Systems, at disk0:hfr-base-4.2.0
    Built on Mon Dec 19 10:51:54 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

hfr-os-mbi, V 4.2.0[00], Cisco Systems, at disk0:hfr-os-mbi-4.2.0
```

```
    Built on Mon Dec 19 10:53:39 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

Configuration register on node 0/RP0/CPU0 is 0x102
Boot device on node 0/RP0/CPU0 is disk0:
Package active on node 0/RP0/CPU0:
iosxr-ce, V 4.2.0[00], Cisco Systems, at disk0:iosxr-ce-4.2.0
    Built on Mon Dec 19 10:51:54 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

hfr-doc-supp, V 4.2.0[00], Cisco Systems, at disk0:hfr-doc-supp-4.2.0
    Built on Mon Dec 19 11:14:54 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

hfr-ce, V 4.2.0[00], Cisco Systems, at disk0:hfr-ce-4.2.0
    Built on Mon Dec 19 10:51:56 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

iosxr-security, V 4.2.0[00], Cisco Systems, at disk0:iosxr-security-4.2.0
    Built on Mon Dec 19 11:13:58 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

iosxr-mpls, V 4.2.0[00], Cisco Systems, at disk0:iosxr-mpls-4.2.0
    Built on Mon Dec 19 10:51:30 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

iosxr-mgbl, V 4.2.0[00], Cisco Systems, at disk0:iosxr-mgbl-4.2.0
    Built on Mon Dec 19 10:51:24 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

iosxr-mcast, V 4.2.0[00], Cisco Systems, at disk0:iosxr-mcast-4.2.0
    Built on Mon Dec 19 10:51:41 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

iosxr-routing, V 4.2.0[00], Cisco Systems, at disk0:iosxr-routing-4.2.0
    Built on Mon Dec 19 10:51:54 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

iosxr-infra, V 4.2.0[00], Cisco Systems, at disk0:iosxr-infra-4.2.0
    Built on Mon Dec 19 10:51:54 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

hfr-fwding, V 4.2.0[00], Cisco Systems, at disk0:hfr-fwding-4.2.0
    Built on Mon Dec 19 10:51:56 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

iosxr-fwding, V 4.2.0[00], Cisco Systems, at disk0:iosxr-fwding-4.2.0
    Built on Mon Dec 19 10:51:54 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

iosxr-diags, V 4.2.0[00], Cisco Systems, at disk0:iosxr-diags-4.2.0
    Built on Mon Dec 19 10:51:54 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

hfr-fpd, V 4.2.0[00], Cisco Systems, at disk0:hfr-fpd-4.2.0
    Built on Mon Dec 19 11:14:32 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

hfr-diags-supp, V 4.2.0[00], Cisco Systems, at disk0:hfr-diags-supp-4.2.0
    Built on Mon Dec 19 11:14:09 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

hfr-k9sec-supp, V 4.2.0[00], Cisco Systems, at disk0:hfr-k9sec-supp-4.2.0
    Built on Mon Dec 19 11:13:58 PST 2011
```

```
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

hfr-mgbl-supp, V 4.2.0[00], Cisco Systems, at disk0:hfr-mgbl-supp-4.2.0
    Built on Mon Dec 19 10:51:24 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

hfr-mcast-supp, V 4.2.0[00], Cisco Systems, at disk0:hfr-mcast-supp-4.2.0
    Built on Mon Dec 19 10:51:41 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

hfr-base, V 4.2.0[00], Cisco Systems, at disk0:hfr-base-4.2.0
    Built on Mon Dec 19 10:51:54 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

hfr-os-mbi, V 4.2.0[00], Cisco Systems, at disk0:hfr-os-mbi-4.2.0
    Built on Mon Dec 19 10:53:39 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

Configuration register on node 0/RP1/CPU0 is 0x102
Boot device on node 0/RP1/CPU0 is disk0:
Package active on node 0/RP1/CPU0:
iosxr-ce, V 4.2.0[00], Cisco Systems, at disk0:iosxr-ce-4.2.0
    Built on Mon Dec 19 10:51:54 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

hfr-doc-supp, V 4.2.0[00], Cisco Systems, at disk0:hfr-doc-supp-4.2.0
    Built on Mon Dec 19 11:14:54 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

hfr-ce, V 4.2.0[00], Cisco Systems, at disk0:hfr-ce-4.2.0
    Built on Mon Dec 19 10:51:56 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

iosxr-security, V 4.2.0[00], Cisco Systems, at disk0:iosxr-security-4.2.0
    Built on Mon Dec 19 11:13:58 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

iosxr-mpls, V 4.2.0[00], Cisco Systems, at disk0:iosxr-mpls-4.2.0
    Built on Mon Dec 19 10:51:30 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

iosxr-mgbl, V 4.2.0[00], Cisco Systems, at disk0:iosxr-mgbl-4.2.0
    Built on Mon Dec 19 10:51:24 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

iosxr-mcast, V 4.2.0[00], Cisco Systems, at disk0:iosxr-mcast-4.2.0
    Built on Mon Dec 19 10:51:41 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

iosxr-routing, V 4.2.0[00], Cisco Systems, at disk0:iosxr-routing-4.2.0
    Built on Mon Dec 19 10:51:54 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

iosxr-infra, V 4.2.0[00], Cisco Systems, at disk0:iosxr-infra-4.2.0
    Built on Mon Dec 19 10:51:54 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

hfr-fwding, V 4.2.0[00], Cisco Systems, at disk0:hfr-fwding-4.2.0
    Built on Mon Dec 19 10:51:56 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

iosxr-fwding, V 4.2.0[00], Cisco Systems, at disk0:iosxr-fwding-4.2.0
    Built on Mon Dec 19 10:51:54 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie
```

```
iosxr-diags, V 4.2.0[00], Cisco Systems, at disk0:iosxr-diags-4.2.0
    Built on Mon Dec 19 10:51:54 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

hfr-fpd, V 4.2.0[00], Cisco Systems, at disk0:hfr-fpd-4.2.0
    Built on Mon Dec 19 11:14:32 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

hfr-diags-supp, V 4.2.0[00], Cisco Systems, at disk0:hfr-diags-supp-4.2.0
    Built on Mon Dec 19 11:14:09 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

hfr-k9sec-supp, V 4.2.0[00], Cisco Systems, at disk0:hfr-k9sec-supp-4.2.0
    Built on Mon Dec 19 11:13:58 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

hfr-mgbl-supp, V 4.2.0[00], Cisco Systems, at disk0:hfr-mgbl-supp-4.2.0
    Built on Mon Dec 19 10:51:24 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

hfr-mcast-supp, V 4.2.0[00], Cisco Systems, at disk0:hfr-mcast-supp-4.2.0
    Built on Mon Dec 19 10:51:41 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

hfr-base, V 4.2.0[00], Cisco Systems, at disk0:hfr-base-4.2.0
    Built on Mon Dec 19 10:51:54 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

hfr-os-mbi, V 4.2.0[00], Cisco Systems, at disk0:hfr-os-mbi-4.2.0
    Built on Mon Dec 19 10:53:39 PST 2011
    By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie
```

New Cisco CRS Router Software Features

The following new software features were introduced in Cisco IOS XR Software Release 4.2 on the Cisco CRS platform:

- SNMP over IPv6—The Cisco IOS XR Software Release 4.2 supports Simple Network Management Protocol (SNMP) over IPv6 on the Cisco CRS router. The following SNMP commands are provided with IPv6 support in the Cisco IOS XR Software Release 4.2:
  - snmp-server host
  - snmp-server target-list
  - snmp-server vrf
  - snmp-server engineid remote

  For more information about SNMP server commands, see the *SNMP Server Commands on Cisco IOS XR Software* section in Cisco *IOS XR System Management Command Reference*.
- Cloud Centric Network (CCN)—This feature supports CCN for virtual data center allocation for CRS router with CGSE blade. The CRS-CGSE platform supports the Communication Channel (CC) and Service Resolution (SR) parts of the CCN solution.

- FAT Pseudowire—Flow Aware Transport Pseudowires (FAT PW) are used to load balance traffic in the core when equal cost multipaths (ECMP) are used. The flow, in this context, refers to a sequence of packets that have the same source and destination pair. The packets are transported from a source provider edge (PE) to a destination PE. All core routers perform load balancing based on the flow-label in the FAT PW. Therefore, it is possible to distribute flows over ECMPs and link bundles
- VPLS over TE FRR—Virtual Private LAN Service (VPLS) enables geographically separated local-area network (LAN) segments to be interconnected as a single bridged domain over an MPLS network. The Cisco IOS XR Software Release 4.2 supports VPLS over Traffic Engineering Re-route (VPLS over TE FRR) on the Cisco CRS router. For more information about this feature, see the *Cisco IOS XR Virtual Private Network Configuration Guide for the Cisco CRS Router.*
- Bundle AC (Attachment Circuit) with Layer 2 QoS—The Cisco IOS XR Software Release 4.2 supports QoS on Layer 2 Bundle interfaces or Bundle ACs (Attachment Circuits). Bundled interfaces increase bandwidth availability, because traffic is forwarded over all available members of the bundle. All QoS (Quality of Service) features, currently supported on Layer 3 physical interfaces, are also supported on all Link Bundle interfaces. All QoS features currently supported on Layer 3 physical sub interfaces are also supported on Layer 2 bundles, bundle VLANs and bundle-VLAN interfaces. The following restrictions are noted during QoS configuration Layer 2 bundle interfaces:
  - Parameters for QoS actions can only be specified as percentages.
  - WRED and queue limit parameters can only be configured in time units.
  - A policer rate limit greater than 16 GB per class cannot be configuration.

  For more information about QoS commands, see the *Cisco IOS XR Modular Quality of Service Command Reference for the Cisco CRS Router.*
- Static MAC Filter—The Static MAC Filter feature allows you to configure static MACs with drop option under a bridge domain.
- SPRAS Ltrace Enhancements—This feature optimizes Ltrace memory allocation based on actual memory usage, therefore ensuring memory saving without sacrificing debuggability.
- Active RP Isolation—Non Stop Routing (NSR) mechanism supports migration of routing sessions from active to standby RP without notifying peers, in case of a routing failure on the Active RP. Instead of reloading the Active RP to initiate switchover, RP Isolation is triggered by isolating the node on Control-Eth and Fabric. Once this node is isolated from the rest of the system, mastership is released to the standby RP which triggers the failover and the old Active RP is retained in the isolated state. All debugging information required can be now collected from this node without compromising the failover time. Once the required information is collected, the node is reset to come back up as the standby node.
- FRoMPLS—Frame over MPLS (FRoMPLS) provides the ability to create Layer 2 attachment circuits on a frame relay DLCI and transports frame relay traffic over FRoMPLS pseudowires.
- MAC Accounting on Bundles—The MAC Accounting feature provides per MAC address statistics in IOS XR. These statistics are used for traffic monitoring, debugging and billing. Packets on ingress and egress interfaces are counted; the counting is based on the source MAC address of packets for ingress accounting and destination MAC addresses for egress accounting.
- VRF Aware IPv4 ABF—VRF-Aware IPv4 ABF feature is supported in CRS Platform for the Cisco IOS XR Software Release 4.2. This feature provides configuration of up to 3 next hop addresses belonging to a VRF table rather than a global routing table.

  There are three types of next hop addresses per ACE available for the Release 4.2:

  - VRF Next Hop Address—This indicates that an IPv4 address can be specified with VRF name. This next hop address is programmed into the ACE result and is used for forwarding, if this is the first 'UP' address and is reachable in the VRF table.
  - VRF Default Next Hop Address—This indicates that an IPv4 default next hop can be specified with VRF name. This default next hop address is programmed into the ACE result and is used for forwarding only on the condition that there is no explicit route available for the packet to the destination address in the global routing table.
  - VRF Select—This indicates that no VRF name and no IPv4 address can be specified. Here the first available VRF is programmed into the ACE result and the destination address of the packets is used to do the forwarding lookup in the VRF table.

  For more information about RCMD, see the *Cisco IOS XR Routing Configuration Guide for the Cisco CRS Router.*

- Route Convergence Monitoring and Diagnostics (RCMD)—Route Convergence Monitoring and Diagnostics (RCMD) monitors OSPF and ISIS convergence events, gathers details about the SPF runs and time taken to provision routes and LDP labels across all LCs on the router. It is a tool that collects and reports data related to routing convergence. Route convergence monitoring involves identification of event triggers within a routing protocol tracking the time taken in processing and gathering of additional data about the protocol event state for better understanding of the event. RCMD runs in two modes:
  - Monitoring—This mode is used in detecting events and measuring convergence.
  - Diagnostics—This mode is used in collecting additional (debug) information for abnormal events.

  For more information about RCMD, see the *Cisco IOS XR Routing Configuration Guide for the Cisco CRS Router.*

- High Availability for Lawful Intercept—The high availability for lawful intercept is a feature enabled by default from Release 4.2 onwards. It provides operational continuity of the TAP flows and provisioned MD (Mediation Device) tables to reduce loss of information due to route processor fail over (RPFO).

  When RPFO is detected, MDs are required to re-provision all the rows related to CISCO-TAP2-MIB, CISCO-IP-TAP-MIB and CISCO-USER-CONNECTION-TAP-MIB, to synchronize database view across RP and MD. The replay timer, an internal timeout is used to re-provision TAP entries smoothly while maintaining existing TAP flows. For more information about high availability for lawful intercept, see the *Cisco IOS XR System Security Configuration Guide for the Cisco CRS Router.*

- CISCO-IP-STAT-MIB—The CISCO-IP-STAT-MIB incorporates objects to provide support for the Cisco IP statistics as implemented in command interfaces. cipPrecendenceTable, cipMacTable, cipMacFreeTable, cipPrecedenceXTable, cipMacXTable are the tables available in CISCO-IP-STAT-MIB. For more information about the tables, see the *Cisco Carrier Routing System and Cisco XR 12000 Series Router MIB Support Guide.*

- IF-MIB Congestion Control Support—A packet from ingress interface traverses through various internal queues before reaching the egress interface. Packets can be dropped when any of these queues cannot hold them, either due to the full queue or based on some policies or priorities. The respective queue or device drivers like ASIC drivers, interface drivers, platform manager, QoS EA, etc. can track the drop of the packets.

  CISCO-IF-EXTENSION-MIB consists of two objects, cieIfInOctetRate and cieIfOutOctetRate for reporting number of bytes of data transferred from or to the interface within 5 minutes. The other two objects, cieIfInputQueueDrops and cieIfOutputQueueDrops are used for reporting packet drops in queues available through Stats Infrastructure. While configuring an interface for congestion

control, a callback is registered with interface manager to get the bandwidth change and also notified to update rising threshold or falling threshold. All the interface types supported for packet loss configuration are also applicable to congestion control configurations.

- IF-MIB Congestion Control Trap—When congestion control goes above upper threshold, a SNMP trap is generated to indicate that an event is set. When congestion control goes below lower threshold, another SNMP trap is generated to indicate that an event is cleared. mteTriggerThreshold table contains the details on threshold values for congestion control. The following provides sample trap information:

```
Received SNMPv2c Trap:
Community: public
From: 12.25.20.9
sysUpTimeInstance = 618943
snmpTrapOID.0 = mteTriggerFalling
ifType.87 = hdlc(118)
ifName.87 = POS0/2/0/0
mteHotValue.0 = 3500
mteHotOID.0 = [cieIfInOctetRate.87 | cieIfInputQueueDrops.87]
mteHotContextName.0 =
mteHotTargetName.0 =
mteHotTrigger.0 = POS0_2_0_0-ingress

Received SNMPv2c Trap:
Community: public
From: 12.25.20.9
sysUpTimeInstance = 619943
snmpTrapOID.0 = mteTriggerRising
ifType.87 = hdlc(118)
ifName.87 = POS0/2/0/0
mteHotValue.0 = 4000
mteHotOID.0 = [cieIfOutOctetRate.87 | cieIfOutputQueueDrops.87]
mteHotContextName.0 =
mteHotTargetName.0 =
mteHotTrigger.0 = POS0_2_0_0-egress
```

- SNMP Request Concurrent Processing Infrastructure - the master agent was enhanced to processes multiple snmp requests asynchrously and concurrently.
- Added new CLI commands for Entity-MIB to improve the trace and debug functionalities of Entity-MIB:
  - **show snmp trace entity build**
  - **show snmp trace entity error**
  - **show snmp trace entity fan**
  - **show snmp trace entity free**
  - **show snmp trace entity power**
  - **show snmp trace entity OIR**
  - **show snmp trace entity LR**
  - show snmp trace entity client
  - show snmp entity mapping nodeid
  - show snmp entity mapping alias
- Monitoring capability for SNMP packet processing and model the performance - Instrumented the code to trace path and time required to process for the request, response and traps. The new tools may be used by customers to check performance:

  - **show snmp trace slow pdus**
  - **snmp-server logging threshold pdu-processing [X]**
  - **show snmp trace initialization**
  - **show snmp queue trap**
  - **show snmp queue rx**
- Notification sent to EEM for every OUTGOING trap from SNMP.
- Multiple Group Optimization (MGO) for HSRP—By running the Hot Standby Router Protocol (HSRP) control traffic for just one of the sessions, MGO reduces control traffic in a deployment consisting of many subinterfaces with identical redundancy requirements. All other sessions that become slaves of this session inherit their state from this session. For more information about MGO, see the *Cisco IOS XR IP Address and Services Configuration Guide of the Cisco CRS Router.*
- Redundancy Manageability Improvements—This feature supports configuration, control and monitoring of redundancy protection for various kinds of components on Cisco managed devices. It is a generic approach to handle basic redundancy control and monitoring for many types of redundant member components and redundancy architectures as long as there is an Entity MIB entPhysicalIntex and entPhysicalVendorType assigned to each member component. For more information about this feature, see the *Cisco Carrier Routing System and Cisco XR 12000 Series Router MIB Support Guide*.
- Security Hardening—In Cisco IOS XR LPTS, as part of for-us packet delivery process, the rate at which packets are delivered are selectively monitored to avoid overwhelming the CPU. LPTS filters and polices the packets based on the defined flow-type rate in hardware before punting to the software. Today, some of the control protocols have a configured peer or source interface in some way, but the protocol (application) and/or LPTS ignores the peer configuration or has a single policer rate for all known and unknown (default) connections. This restricts the user's ability to police the rates for known peers differently than for unknown peers.

  Cisco IOS XOR security system needs a granular protocol traffic classification based on the configured peers and ingress interfaces. To classify and distinguish the traffic accurately, the protocol or application needs to have new flow-types and policer rates in hardware. New flow-types such as DNS, RADIUS, TACACS, NTP KNOWN, RSVP KNOWN and PIM MULTICAST KNOWN are added to the configuration. The user gets the new flow types by running the following command:

```
show lpts pifib hardware police location 0/3/CPU0

76 DNS 101 0/0
77 RADIUS 1000 0/0
78 TACACS 101 0/0
79 (null) 101 0/0
```

  For more information about LPTS commands, see the *Cisco IOS XR IP Addresses and Services Command Reference for the Cisco CRS Router.*
- SNMP context/view improvements—The CISCO-CONTEXT-MAPPING-MIB provides an option to associate an SNMP context to a feature package group. This MIB allows manageability of license MIB objects specific to a feature package group. For more information about this feature, see the *Cisco Carrier Routing System and Cisco XR 12000 Series Router MIB Support Guide*.
- VRF-aware IF-MIB—The IF-MIB describes the attributes of physical and logical interface. This MIB is made VRF-aware to provide access to information on selected interfaces stored in IF-MIB table to a user. VRF-aware IF-MIB makes management of IF-MIB table for VRF based network

more secure. The ifTable and ifXTable are VRF-aware tables. For more information about this feature, see the *Cisco Carrier Routing System and Cisco XR 12000 Series Router MIB Support Guide*.

- VRF Aware IP-FORWARD-MIB—The IP-FORWARD-MIB contains objects to control the display of Classless Interdomain Routing (CIDR) multipath IP routes. The IP-FORWARD-MIB is made VRF-aware to provide selective access to information stored in IP forwarding table to user. This makes management of IP forwarding table for VRF based networks more secure. ipForwardTable is a VRF-aware table. For more information about this feature, see *Cisco Carrier Routing System and Cisco XR 12000 Series Router MIB Support Guide*.
- BGP Multi-Instance/Multi-AS— BGP (Border Gateway Protocol) Multi-Instance/Multi-AS feature allows BPM to directly interact with BGP speakers and sends configuration information using the AIPC channels. The Async IPC (AIPC) is a point-to-point communication channel that can be used to read and write bi-directionally. The Cisco IOS XR Software Release 4.2 supports multiple BGP instances running:
  - Different address families within an unit under test (UUT).
  - Different ASes within an UUT with each AS running different address families.
  - VPNv4 unicast address family with mutually exclusive VRFs with an UUT.

  The constraint is that each BGP speaker process must run mutually exclusive address family or VRFs due to the underlying shared RIB/FIB infrastructure. The Cisco IOS XR Software Release 4.2 also facilitates migration of configuration republishing mechanism between BPM process and BGP speaker process(es) from sysdb to Async IPC for filtered configuration publication for each BGP speaker process as well as for reducing load to sysdb.
- OSPFv2 Per-Prefix LFA IPFRR & SRLG support—Per-prefix LFA computation is used to find the backup path for each individual path to the prefix that is subject to the computation based on the user configuration. The computation finds out a neighbor to which traffic for prefix can be sent in case of a primary link failure. This guarantees that the traffic is not sent back to the calculation node. Users can limit the amount of prefixes, for which per-prefix LFA computation is done, thus by associating the minimum prefix priority with the per-prefix LFA computation. Per-prefix LFA considers the local SRLG values during the backup computation. SRLG integration with per-prefix LFA is done through the tiebreaker approach, where SRLG disjoint is used as one of the tiebreakers.
- OSPFv3 Non-Stop Routing (NSR) support—The Cisco IOS XR Software Release 4.2 supports NSR functionality for OSPFv3 processes. When NSR is enabled (disabled by default), OSPFv3 processes on the active RP, synchronizes all necessary data, and states with the OSPFv3 process on the standby RP. During the switchover, OSPFv3 processes on the newly active RP has all the necessary data and states to continue running, and does not require any help from its neighbors.
- Route Consistency Checker (RCC) and Label Consistency Checker (LCC)—RCC and LCC are used to verify consistency periodically in the background, as well as on-demand from the CLI, between control plane and data plane route and label programming in a Cisco IOS XR Software. Any detected inconsistencies are re-verified to ensure no false positives, and the detection mechanism uses an adaptive algorithm to ensure that route and label convergence are not affected in any way. For more information on how to use the RCC and LCC, see the *Cisco IOS XR Routing Configuration Guide for the Cisco CRS-1 Router.*
- Hierarchical RPL—Hierarchical Routing Policy Language (RPL) enables apply condition policies to specify a route policy in the “if” statement of another route policy. It also enables route policies to be applied for configurations based on hierarchical policies. Cisco IOS XR RPL supports apply condition policies that can be used with various types of Boolean operators along with various other matching statements. Apply conditions can also be used with parameters and are supported on all attach points and on all clients. Hierarchical apply conditions can be used without any constraints on cascaded level.

- System-wide Route and Label Prioritization—System-wide Route and Label Prioritization feature provides faster and more consistent Interior Gateway Protocol (IGP) convergence due to router or network events. For more information on how to prioritize and download the critical routes and labels, see the *Cisco IOS XR Routing Configuration Guide for the Cisco CRS Router.*
- Label Consistency Checker—The Label Consistency Checker (RCC) is used to verify consistency between control plane and data plane route and label programming in Cisco IOS XR Software. For more information on how to use the LCC, see the *Cisco IOS XR Routing Configuration Guide for the Cisco CRS Router.*
- MPLS Traffic Engineering (TE) Soft Preemption—Multiprotocol Label Switching (MPLS) TE Soft Preemption is an extension to the Resource ReSerVation Protocol Traffic Engineering (RSVP-TE) protocol to minimize or eliminate the traffic disruption over the preempted Label Switched Paths (LSPs). For more information on how to achieve zero traffic loss, see the *Cisco IOS XR MPLS Configuration Guide for the Cisco CRS Router.*
- MPLS Traffic Engineering (TE) Path-Option Attributes—MPLS TE path option attributes are configurable through a template configuration. This template named attribute-set, is configured globally in the MPLS TE mode. For more information on how to implement path option attributes, see the *Cisco IOS XR MPLS Configuration Guide for the Cisco CRS Router.*

Cisco CRS-3 Software Features

Note With Cisco IOS XR Release 4.2.0, the CRS MSC-140 or FP-140 line cards can be used for Provider (P) and Provider Edge (PE) applications supporting core and Layer 2/3 edge features.

The following features are now supported on the Cisco CRS-3 Router in Cisco IOS XR Software Release 4.2:

- Generic Routing Encapsulation (GRE)—The Generic Routing Encapsulation (GRE) tunneling protocol provides a generic approach to transport packets of one protocol over another protocol by means of encapsulation. This feature supports transport of IPv4, IPv6, MPLS unicast traffic over IPv4 (transport) networks. These features are also supported:
  - 6PE/6VPE over IPv4 GRE tunnels
  - Routing Protocols over P2P v4-GRE
  - TE/RSVP over v4-GRE
  - L2VPN
  - L3VPN
- IPv6 support for ACL-based Forwarding—Cisco IOS XR Software Release 4.2 provides IPv6 support for ACL-based forwarding. ACL-based forwarding enables you to choose service from multiple providers for broadcast TV over IP, IP telephony, data, etc. Service providers can divert user traffic to various content providers.

  IPv6 ABF supports these features:
  - Up to three IPv6 Next-Hop addresses can be configured per ACE
  - The Next-Hop address can be in any VRF
  - Default ABF Next-Hop
  - VRF select and VRF Aware ABF

  - Up to three VRFs can be selected in *VRF select* mode

- Netflow support for IPv4 Destination Based Accounting (DBA)—This feature helps customers to bill depending on the traffic destination (within the ISP network, metropolitan area, state, country, continent, a particular peer ISP, etc.). This feature supports unicast and multicast traffic.

Note Contact crs-pm@cisco.com for hardware availability.

New Hardware Features for the Cisco CRS router

The following new hardware features were introduced in Cisco IOS XR Software Release 4.2 on the Cisco CRS router:

- Cisco CRS PCMCIA Flash Disk 16 GB—The Cisco IOS XR Software Release 4.2 supports the Cisco CRS PCMCIA Flash Disk 16 GB on RP (A and B), DRP and SC-Ges. The cards must be formatted within the Cisco IOS XR Software with FAT32 file system.
- Cisco CRS 16-Slot Enhanced Line Card Chassis—The Cisco IOS XR Software Release 4.2 supports 16-Slot enhanced line card chassis. The Cisco CRS 16-Slot Enhanced Line Card Chassis supports 400G per slot bandwidth and increases the cooling capacity of the system.

  This chassis is compatible with all existing line cards (MSC and PLIMs), Fabric Cards, DRPs, RP (RP-B and PRP) and Arctic I power Module. However, system level hardware like Power Shelves, Alarm Modules, Fan Trays, Fan Controllers, CRS-3 Fan Controllers are different for Cisco CRS 16-Slot Enhanced Line Card Chassis and Cisco CRS 16-Slot Line Card Chassis and these hardware are not compatible with each other.
- Cisco CRS 8-Slot Enhanced Line Card Chassis—Cisco IOS XR Software Release 4.2 provides support for the Cisco CRS Series Enhanced 8-slot Line Card Chassis (LCC). The Cisco CRS Series Enhanced 8-slot LCC is a chassis that has 8 slots for modular service cards (MSCs), forwarding processor (FPs) cards, and label switch processor (LSP) cards (all referred to as line cards); associated physical layer interface modules (PLIMs) and SPA Interface Processors (SIPs). Each slot has the capacity of up to 400 gigabits per second (Gbps) ingress and 400 Gbps egress, for a total routing capacity per chassis of 12.8 terabits.

  The LCC supports both 40 G and 140 G fabric cards and line cards. The Cisco CRS-1 Carrier Routing System uses fabric cards designed for 40 G operation (CRS-8-FC/S or CRS-8-FC/M cards) and the Cisco CRS-3 Carrier Routing System uses fabric cards designed for 140 G operation (CRS-8-FC140/S or CRS-8-FC140/M cards). A mixture of 40 G and 140 G fabric cards is not supported except during migration.

Important Notes

- **Default timestamp setting**—The timestamp prompt that precedes console output is enabled by default in Cisco IOS XR Release 3.8. To disable the timestamp prompt, use the **no service timestamp** command. For more information, refer to the *Cisco IOS XR System Management Command Reference for the Cisco CRS Router*.
- From Cisco IOS XR Software Release 3.6.0, WRED statements are collapsed in that if different random-detect statements using the same match types (EXP, DSCP, Prec, and so forth) are entered with identical minimum and maximum threshold values, a single configuration line is shown in the output of **show running config**. This reduces the length of the configuration but creates a problem with backward compatibility with previous releases. In such a situation, on rollback, the QoS policy is rejected and must be manually entered again.

  Configuration prior to Cisco IOS XR Software Release 3.6.0:

```
Policy-map wred_example
   Class class-default
        random-detect exp 0 384 packets 484 packets
        random-detect exp 1 384 packets 484 packets
        random-detect exp 2 384 packets 484 packets
        random-detect exp 3 484 packets 584 packets
        random-detect exp 4 484 packets 584 packets
        random-detect discard-class 0 384 packets 484 packets
       random-detect discard-class 1 384 packets 484 packets
       random-detect discard-class 2 484 packets 584 packets
       bandwidth remaining percent 20
```

  Cisco IOS XR Software Release 3.6.0 and later releases:

```
policy-map wred_example
 class class-default
  random-detect exp 0,1,2 384 packets 484 packets
  random-detect exp 3,4 484 packets 584 packets
  random-detect discard-class 0,1 384 packets 484 packets
  random-detect discard-class 2 484 packets 584 packets
  bandwidth remaining percent 20
 !
 end-policy-map
!
end
```

  In Cisco IOS XR Software Release 3.6.0 and later releases, the implicitly assigned QoS class class-default must have at least 1 percent bandwidth made available to it. This can be done either by assigning at least 1 percent explicitly (bandwidth remaining percent 1) or by ensuring that the total bandwidth assigned to all other classes in the policy is a maximum of 99 percent, leaving 1 percent available for the class-default. A QoS policy that does not have any bandwidth for class-default is rejected when upgrading to Cisco IOS XR Software Release 3.6.0 or later releases.
- **Country-specific laws, regulations, and licences—**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.
- **Card, fan controller, and RP 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 IOS XR Getting Started Guide for the Cisco CRS Router* 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 maximum for your purpose.
- **mpls traffic engineering igp-intact** command—This command must be used only when policy based tunnel selection is configured for all tunnels originating on the device.
- The following TE Path option attribute commands are not supported on the Cisco CRS-1 Series Router:
  - affinity location set
  - affinity location type
  - affinity program
  - affinity self
- BFD IPv6 UDP Checksum Calculation—In Cisco IOS XR Software Release 3.9, you turn the BFD IPv6 UDP checksum calculation on and off:
  - To disable the BFD IPv6 UDP checksum calculation:

```
RP/0/RP0/CPU0:router(config)#bfd
RP/0/RP0/CPU0:router(config-bfd)#ipv6 checksum disable
RP/0/RP0/CPU0:router(config-bfd)#end
```

  - To enable BFD IPv6 UDP checksum calculation:

```
RP/0/RP0/CPU0:router(config)#bfd
RP/0/RP0/CPU0:router(config-bfd)#no ipv6 checksum disable
RP/0/RP0/CPU0:router(config-bfd)#end
```

- On upgrading Cisco IOS XR CRS-1 Software from 3.6.2 to 4.0.0 the MAC address assigned to physical interfaces changes. This is required because prior to Cisco IOS XR Software Release 3.8.4 the MAC address assigned to the bundle interface was taken from the first member's MAC address. If this bundle member is removed from the bundle, the bundle gets a new MAC address, which results in traffic loss due to ARP resolution. Beginning in Cisco IOS XR Software Release 3.8.4, a pool of MAC addresses are assigned to the bundle interfaces by the bundlemgr process during bundle interface creation.
- Deactivation of os-mbi dependent (Nonreload) SMU fails—Backing out the non reload os-mbi SMU fails because deactivation runs out of memory (activation did not release some memory, which stayed at 38 MB). This failure to activate or deactivate the SMU due to insufficient SP resources impacts SP cards on CRS.
- When configuring the Label Distribution Protocol (LDP) graceful restart (GR) process in a network with multiple [link and/or targeted] LDP hello adjacencies with the same neighbor, make sure that GR is activated on the session before any hello adjacency times out due to neighbor control plane failures. One way of achieving this is by configuring a lower session hold time between neighbors such that session time out always occurs before hello adjacency can time out. Cisco recommends setting LDP session hold time using the following formula:

  LDP session hold time <= (Hello hold time - Hello interval) * 3

  This means that for default values of 15/5 seconds respectively for the link Hello hold time and the Hello interval, the LDP session hold time should be set to 30 seconds or less.

  For more information, refer to the Implementing MPLS Label Distribution Protocol on Cisco IOS XR Software section of the *Cisco IOS XR MPLS Configuration Guide, Release 4.0*.
- For information about upgrading from a Cisco CRS-1 to a Cisco CRS-3 chassis, refer to the *Cisco CRS-1 Carrier Routing System to Cisco CRS-3 Carrier Routing System Upgrade Guide* at the following URL:

http://www.cisco.com/en/US/products/ps5763/prod_installation_guides_list.html

- The following commands have been modified to support Cisco CRS-3 router:
  - show environment
  - hw-module reload
  - show controllers egressq client location
  - show controllers egressq queue drr [max | min] location <>
  - show controllers egressq group drr [max | min] location <>
  - show controllers egressq group ntb [max | min] location <>
  - show controllers egressq port bpmap location <>
  - show controllers egressq statistics detail location <>
  - show controllers egressq resources location <>

  For information about these commands, refer to the Commands section of the *Cisco CRS-1 Carrier Routing System to Cisco CRS-3 Carrier Routing System Upgrade Guide:*

  http://www.cisco.com/en/US/products/ps5763/prod_installation_guides_list.html
- For Cisco IOS XR Software Release 4.0.0 and above, after upgrading, the FPGA upgrade using the **auto-fpd upgrade** command as a part of the auto-fpd upgrade process fails for the SPA-1X10GE-L-V2 SPA. The workaround is to perform a manual FPGA upgrade on the SPA-1X10GE-L-V2 SPA using the **upgrade hw-module fpd fpga1 location 0/0/1** command in admin mode after the **auto-fpd upgrade** command execution completes.
- The minimum timer configuration value for the BFD on Bundle Members feature (BoB) increases from 30 to 60 seconds in Cisco IOS XR Software Release 4.2. The timer value can be left as default or modified as follows:
  - int bundle-(ether|pos) <num>
  - bfd address-family ipv4 timers start <30-3600>
  - bfd address-family ipv4 timers nbr-unconfig <30-3600>
- This release supports the following fixed DWDM XFPs with CRS-3 and certain CRS-1 10GE interface modules:
  - DWDM-XFP-30.33
  - DWDM-XFP-60.61
  - DWDM-XFP-50.92
  - DWDM-XFP-50.12
  - DWDM-XFP-31.12
  - DWDM-XFP-31.90
  - DWDM-XFP-32.68
  - DWDM-XFP-34.25
  - DWDM-XFP-35.04
  - DWDM-XFP-35.82
  - DWDM-XFP-36.61
  - DWDM-XFP-38.19
  - DWDM-XFP-38.98

  - DWDM-XFP-39.77
  - DWDM-XFP-40.56
  - DWDM-XFP-42.14
  - DWDM-XFP-42.94
  - DWDM-XFP-43.73
  - DWDM-XFP-44.53
  - DWDM-XFP-46.12
  - DWDM-XFP-46.92
  - DWDM-XFP-47.72
  - DWDM-XFP-48.51
  - DWDM-XFP-51.72
  - DWDM-XFP-52.52
  - DWDM-XFP-54.13
  - DWDM-XFP-54.94
  - DWDM-XFP-55.75
  - DWDM-XFP-56.55
  - DWDM-XFP-58.17
  - DWDM-XFP-58.98
  - DWDM-XFP-59.79

  Reference caveat, CSCtk96820. Please contact your Cisco representative for more information on dates by which this will be available.

- For Cisco IOS XR Software Release 4.0.0 and above the **hw-module location <LOC> reload warm** command has been disabled. This means that the warm reload feature has been disabled.
- Bug fixes specific to CRS-1 multi-chassis system with RP-B will be delivered via SMU by January 31, 2012. Cisco recommends deploying this configuration after the SMU becomes available on Cisco.com.
- On rare occassions, during Cisco IOS XR Software Release 4.2.0 testing, we have observed issues while making bulk configuration changes (1000+ lines) in a single configuration (Using copy (remote) running, commit replace and rollback.) We recommend that you archive configurations before executing bulk configuration changes on this scale in Cisco IOS XR Software Release 4.2.0. This way you can easily retry or compare results.

New DWDM Configuration Requirement

Note This section describes only the new DWDM configuration requirements in Cisco IOS XR 3.9.0 and later releases. It does not describe all updates to the DWDM feature. For more information about DWDM configuration, refer to the Configuring Dense Wavelength Division Multiplexing Controllers on Cisco IOS XR Software module in the *Cisco IOS XR Interface and Hardware Component Configuration Guide for the Cisco CRS Router.*

Cisco IOS XR Software Release 3.9.0 introduced new commands in addition to an important change to the default laser state for all of the DWDM physical layer interface modules (PLIMs) supported on the Cisco CRS-1 router, which impacts the required configuration to support those cards.

This change affects all models of the following hardware on the Cisco CRS-1 router:

- Cisco 1-Port OC-768c/STM-256c DWDM PLIM
- Cisco 4-Port 10-Gigabit Ethernet DWDM PLIM

Summary of Important DWDM Changes in Cisco IOS XR Software Release 3.9.0 and Later Releases

- The **laser off** and **shutdown (DWDM)** commands are replaced by the **admin-state out-of-service** command.
- The default state of the laser has changed from "On" to "Off" for all PLIMs. Therefore, the laser for all DWDM controllers must explicitly be turned on using the **admin-state in-service** command in DWDM configuration mode.

Configuration Examples in Cisco IOS XR Software Release 3.9.0 and Later Releases

This section provides configuration examples for turning on and off the laser on a DWDM PLIM.

Turning On the Laser: Example

Note This is a required configuration beginning in Cisco IOS XR Software Release 3.9.0. The DWDM PLIMs will not operate without this configuration.

The following example shows how to turn on the laser and place a DWDM port in In Service (IS) state:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# controller dwdm 0/1/0/1
RP/0/RP0/CPU0:router(config-dwdm)# admin-state in-service
RP/0/RP0/CPU0:router(config-dwdm)# commit
```

Turning Off the Laser: Example

Note This configuration replaces the **laser off** and **shutdown (DWDM)** configuration commands.

The following example shows how to turn off the laser, stop all traffic and place a DWDM port in Out of Service (OOS) state:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# controller dwdm 0/1/0/1
RP/0/RP0/CPU0:router(config-dwdm)# admin-state out-of-service
RP/0/RP0/CPU0:router(config-dwdm)# commit
```

Minimum Flash Disk Requirements When Upgrading to Release 4.2

Cisco IOS XR Software Release 4.2 requires a minimum of 4-GB Flash Disk. This release also provides an upgrade option to 16-GB Flash Disk. 1-GB and 2-GB Flash Disks are no longer supported with this release. For information on End-of-Sale and End-of-Life Announcement for the Cisco CRS-1 PCMCIA Flash Disk 2 GB, refer to:
http://www.cisco.com/en/US/prod/collateral/routers/ps5763/end_of_life_notice_c51-681333.htm

To upgrade from a 1-GB or 2-GB to a greater Flash Disk, refer to the *Flash Disk Upgrade Tasks* link on the following Cisco CRS router Installation and Upgrade URL:
http://www.cisco.com/en/US/products/ps5763/prod_installation_guides_list.html

For Cisco CRS routers, change to FAT32 in order to partition a 4 GB Flash Disk as a 3.5 GB and 0.5 GB partition. This type of partition is recommended in order to create a partition with more than 2 GB of flash space. Disk partitioning has been supported from Cisco IOS XR Software Release 3.6 onwards. For more information, refer to the Turbo Boot Appendix of the *Cisco CRS-1 Carrier Routing System to Cisco CRS-3 Carrier Routing System Migration Guide*.

Additional upgrade instructions for the Cisco CRS router are available from
http://www.cisco.com/web/Cisco_IOS_XR_Software/pdf/ReplacingPCMCIACardOnCRS-1.pdf

Caveats

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

This section contains caveats that are generic to the Cisco IOS XR Software Release 4.2 and those specific to the Cisco CRS-1 router and the Cisco CRS-3 router.

Cisco IOS XR Caveats

The following open caveats apply to Cisco IOS XR Software Release 4.2 and are not platform specific:

- **CSCtw80900**

  Basic Description:

  420-PSI: After router reload, new configuration is not applied.

  Symptom:

  1. When performing a commit replace, a syslog similar to the following is displayed:

```
RP/0/RSP0/CPU0:Dec 20 05:02:45.555 : sysdb_mc[399]: %SYSDB-SMC-7-TIMEOUT : Message
#0x200088ed state:0x13fe5326, gid(1009),destined for all local, timed out having
received 7 of 8 expected responses: returning received responses to client config.
Check for potential transport issues within the system, or deadlocked SysDB processes.
```

  2. Following a router reload or LC OIR, configuration that had been previously removed by the commit replace operation reappears in the active running configuration.

  Conditions:

  The following two conditions are the reasons:

  1. The configuration that is being replaced is either,
  a. larger than 20MB (ASCII), or
  b. over 100,000 interfaces on a single LC
  2. The configuration changes involves a Viking RSP3 LC with the following types:

```
0/1/CPU0        A9K-MOD80-SE              IOS XR RUN       PWR,NSHUT,NMON
0/5/CPU0        A9K-24x10GE-SE            IOS XR RUN       PWR,NSHUT,MON
0/0/CPU0        A9K-8T/4-E                IOS XR RUN       PWR,NSHUT,MON
0/4/CPU0        A9K-2T20GE-E              IOS XR RUN       PWR,NSHUT,MON
0/5/CPU0        A9K-2x100GE-TR            IOS XR RUN       PWR,NSHUT,MON
0/6/CPU0        A9K-24x10GE-SE            IOS XR RUN       PWR,NSHUT,MON
0/7/CPU0        A9K-4T-E                  IOS XR RUN       PWR,NSHUT,MON
```

  Workaround:

- If you see the SYSDB-SMC-7-TIMEOUT error message described in Symptom 1 above, and have not yet performed any additional commits,and have not yet performed a router reload or LC OIR:
  - Repeat the original **commit replace** command, until you do not see the sysdb_mc syslog any more.

- If you see the SYSDB-SMC-7-TIMEOUT error message described in Symptom 1 above, and you have performed some addtional configuration commits, and have not yet performed a router reload or LC OIR:
  1. Execute **show running** and verify that the running configuration is what you want.
  2. Execute **cfs check** twice to make sure the running and saved configurations are now in sync and saved properly.
- If you have already performed a router reload or LC OIR and see only old configuration:

  You have two options:

  Option 1:
  1. rollback to the point where you see the sysdb_mc syslog.
  2. repeat the original commit replace operation.
  3. repeat any subsequent configuration changes.

  Option 2: wipe out all the configuration via **commit replace** and re-apply the settings you want to apply.

  After doing Option 1 or Option 2:
  1. Execute **show running** and verify that the running configuration meets your needs.
  2. Execute **cfs check** twice to make sure that the running and saved configuration are now in sync and saved properly.

  Recovery:

  None.
- **CSCtt92490**

  Basic Description:

  xml_tty_agent procedure crash when xml help is requested.

  Symptom:

  Help for CLI over XML does not work. XML agent process does not respond after the request for returning help on CLI show command.

  Conditions:

  When ACT software sends an XML request to the router for help hints, the XML agent did not respond and ACT was blocked. In addition, the Help hints returned were not correct.

  Workaround:

  None. When this is observed on a setup, it can be safely ignored assuming that the hardware under test is functioning good.

  Recovery:

  None.
- **CSCtu31007**

  Basic Description:

  IPv6 LPTS entry was missing for some bundle interfaces. The IPv6 ND packets did not go through and IPv6 traffic was dropped at affected bundle interfaces.

  Symptom:

  IPv6 protocol peering neighbor sessions flapping; IPv6 traffic could not pass.

Conditions:

The bundle interfaces are on CRS-3 linecards. The issue may happen after scaled configuration is restored by either **commit replace** or router reload.

Workaround:

Restart pifibm_server_lc process on the bundle member linecards.

Recovery:

None.

- **CSCtt38345**

  Basic Description:

  The SNMP duplicate request dropping feature is not working.

  Symptom:

  SNMP duplicate request dropping feature is supposed to drop requests from the same NMS and port with the same request ID, and if the number of requests in queue is greater than 20. This feature is not working in 4.2.

  Conditions:

  SNMP duplicate request dropping feature is supposed to drop requests from the same NMS and port with the same request ID and if the number of requests in queue is greater than 20.

  Workaround:

  None.

  Recovery:

  None.

- **CSCtt30049**

  Basic Description:

  Slow SNMP response issue when polling IFMIBs with random-order.

  Symptom:

  Slowing down of SNMP response time is seen and the rate drops to about 45 packets/second under certain conditions.

  Conditions:

  1. When SNMP requests are sent from one NMS/ source IP at a rate greater than 3,000 packets/sec
  2. When SNMP requests are sent from 18 source IPs / 18 NMS stations at a rate of 500 packets/sec or more
  3. When CLI commands (for example, config, show commands) are being run while SNMP requests are being sent by NMS, even at a rate of about 500 packets/sec
  4. SNMP response is slow when polling ifmibs in random-order

  Workaround:

  The above conditions may not be normal scenarios and could be avoided. For example, limit the number of NMSes to 15 or less and their polling frequency. When this is observed on a setup, the hardware under test is assumed to be functionally good in routing/switching.

Recovery:

Avoid concurrently running heavy CLI commands/processing and sending high rate of SNMP requests from NMS. Avoid the above conditions if the system gets into a state of slow response to SNMP requests.

- **CSCtw81342**

  Basic Description:

  Alternate path is used for Inter-AS P2MP TE forwarding after LC reload.

  Symptom:

  After LC OIR affecting egress interface for a P2MP midpoint sub-lsp, the tunnel sub-lsp gets signaled over a path different from one specified at head. Traffic is not impacted.

  Conditions:

  1. Inter-AS P2MP tunnel.
  2. LC OIR affects egress interface for the sub-LSP.
  3. RIB does not withdraw the route to the next-hop address (in down state)- this is timing issue related.

  Workaround:

  1. At head (for affected destination), create a higher preference path-option (lower index) with same properties, and force reoptimization of the tunnel.
  2. Shut/no shut the p2mp tunnel recovers the sub-LSP on the correct path.

  or,

  3. Disable/no disable the p2mp destinatio at head.

  Recovery:

  None.

- **CSCtt31599**

  Basic Description:

  Incorrect pw-type after configuration rollback due to configuration failure.

  Symptom:

  After a configuration reject, the pw-type changes from Ethernet-VLAN to Ethernet.

  Conditions:

  The issue is seen with the following sequence of config steps:

  1. Start with

```
l2vpn
logging
pseudowire
!
pw-class c1
encapsulation mpls
control-word
transport-mode vlan
```

  2. Now configure

```
l2vpn
logging
pseudowire
```

```
!
pw-class mpls_class
encapsulation l2tpv3
transport-mode vlan
```

3. This configuration gets rejected and the configuration applied in step 2 is rolledback.
4. All the PWs that are using this class now have the pw-type as Ethernet instead of Ethernet-vlan.

Workaround:

To recover, re-apply configuration from step1, though the running configuration after step 4 shows the same as in step 1.

Recovery:

None.

- **CSCtt39429**

  Basic Description:

  420: Copy of 4K static route shown fail, although successful.

  Symptom:

  Copying of 4K static route shows error, although successful.

  Conditions:

  When trying to copy 4k static route configuration to running configuration, an error appears stating, "Failed to commit one or more configuration items". However, there is no failure.

  Workaround:

  None.

  Recovery:

  None.

- **CSCtw62111**

  Basic Description:

  Running RCMD diag script may lead to RP Reload.

  Symptom:

  In one specific manifestation, the GSP process could crash with the following message:

  ```
  gsp[238]: %OS-gsp-3-MUTEX_OP_FAILED : get_sgrp_gid: Mutex op cond_wait failed on mutex
  grp_cond (RDS_CGRP_/etc/eem_rdsfs_1) : Connection timed out : pkg/bin/gsp :
  (PID=627769708)
  ```

  There are other possible manifestations for other infra process restarts or deadlocks.

  Conditions:

  When RCMD diagnostics mode is enabled using the following CLI, the RCMD EEM diagnostics script collects debug information from various components within the router.

  ```
  config
    router-convergence
      collect-diagnostics <>
    event manager policy rcmd_diags.tcl username <>
  ```

In certain scenarios, where the CPU utilization is high (100%) over a period of time and the diagnostics script gets triggered, it could create race conditions which causes deadlocks and some processes to restart, leading to reload of the RP.

Workaround:

Disable the RCMD diagnostics script by not registering the EEM policy.

Remove the following CLI:

```
config
  router-convergence
    collect-diagnostics <>
  event manager policy rcmd_diags.tcl username <>
```

Recovery:

None.

Further Problem Description:

It is recommended not to use the RCMD diagnostics feature in 4.2.0 in the production deployment, due to possible delays and deadlocks in the XR infrastructure in certain race conditions while CPU is running at 100% for an extended period.

- **CSCtw47793**

  Basic Description:

  IP/LDP LFA does not choose TE Tunnel as backup with use-candidate-only.

  Symptom:

  TE Tunnel may not be chosen as IP/LDP LFA FRR back-up route.

  Conditions:

  The defect is seen when ISIS has a directly connected neighbor and also a TE tunnel to the directly connected neighbor. If the 'use-candidate-only' is configured with the TE tunnel as the only candidate, the back-up is not calculated.

  Workaround:

  Do not to use the use-candidate-only feature in this scenario. Instead, use explicit exclude statements for excluding interfaces from being used as a back-up.

  Note that this defect would not occur if the Tunnel destination was multiple hops away from ISIS or if ISIS does not have a direct adjacency with the tunnel destination.

  Recovery:

  None.

Caveats Specific to the Cisco CRS-1 Router

There are no open caveats for Cisco CRS-1 in Cisco IOS XR Software Release 4.2.

- **CSCtw85890**

  Basic Description:

  [MC4] p2mp traffic loss on DSC RPFO.

  Symptom:

  Traffic drop on streams going over p2mp TE tunnels after performing a DSC RPFO. The outage lasts about 15 seconds.

Conditions:

- P2MP TE tunnels.
- 4.2 SIT scale profile running on a CRS with RPB single-core DSC.
- DSC failover on P2MP TE head.
- CPU is 100% busy for more than 10 minutess after failover.
- TE-LMRIB connection takes more than 1 minute to re-establish after failover.

Workaround:

None.

Recovery:

None.

Caveats Specific to the Cisco CRS-3 Router

The following open caveats are specific to the Cisco CRS-3 platform:

- **CSCtx04674**

  Basic Description:

  CRS-3 MSC/FP140 linecard, ingress ASIC may rarely reset and lead to linecard reload in a condition with MPLS sampled netflow configured, and a sampled packet is intercepted by lawful interception.

  Symptom:

  On CRS-3 FP140 linecard, ingress ASIC may reset and lead to linecard reload.

  Conditions:

  With MPLS sampled netflow configured, and a sampled packet is intercepted by lawful interception.

  Workaround:

  Do not configure MPLS netflow if lawful interception is configured.

  Recovery:

  Remove the MPLS netflow config or lawful interception config and reload the linecard.

  Fix:

  The issue has been diagnosed and the fix will be available via SMU by the end of January 2012.

Upgrading Cisco IOS XR Software

Cisco IOS XR Software is installed and activated from modular packages, allowing specific features or software patches to be installed, upgraded, or downgraded without affecting unrelated processes. Software packages can be upgraded or downgraded on all supported card types, or on a single card (node).

Software packages are installed from package installation envelope (PIE) files that contain one or more software components.

The following URL contains links to information about how to upgrade Cisco IOS XR Software:

http://www.cisco.com/web/Cisco_IOS_XR_Software/index.html

Migrating Cisco CRS-1 to Cisco CRS-3

For information about migrating from a Cisco CRS-1 to a Cisco CRS-3 chassis, refer to the *Cisco CRS-1 Carrier Routing System to Cisco CRS-3 Carrier Routing System Migration Guide* at the following URL:

http://www.cisco.com/en/US/products/ps5763/prod_installation_guides_list.html

Troubleshooting

For information on troubleshooting Cisco IOS XR Software, refer to the *Cisco IOS XR Troubleshooting Guide for the Cisco CRS router* and the *Cisco IOS XR Getting Started Guide for the Cisco CRS router.*

Related Documentation

The most current Cisco CRS router hardware documentation is located at the following URL:

http://www.cisco.com/en/US/products/ps5763/tsd_products_support_series_home.html

The Cisco IOS XR Software documentation set includes the Cisco IOS XR software configuration guides and command references, as well as a getting started guide.

The most current Cisco CRS router software documentation is located at the following URL:

http://www.cisco.com/en/US/products/ps5763/tsd_products_support_series_home.html

Obtaining Documentation and Submitting a Service Request

For information on obtaining documentation, submitting a service request, and gathering additional information, see *What's New in Cisco Product Documentation* at: http://www.cisco.com/en/US/docs/general/whatsnew/whatsnew.html.

Subscribe to *What's New in Cisco Product Documentation*, which lists all new and revised Cisco technical documentation, as an RSS feed and deliver content directly to your desktop using a reader application. The RSS feeds are a free service.

This document is to be used in conjunction with the documents listed in the "Related Documentation" section.