



Release Notes for Cisco CRS Routers, IOS XR Release 6.2.1

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Release Notes for Cisco CRS Routers, IOS XR Release 6.2.1



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Cisco IOS XR Release 6.2.1 is a limited availability (LA) release. All Cisco IOS XR Release 6.2.1 features are available in Cisco IOS XR Release 6.2.2, which is a general availability (GA) release. For more information on IOS XR Release 6.2.2, refer [Release Notes for Cisco CRS Routers, IOS XR Release 6.2.2](#)

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

<http://www.cisco.com>

This release notes describe the features provided in the Cisco IOS XR Software Release 6.2.1 for the Cisco CRS router.

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

This electronic documents may contain updates and modifications. For more information on obtaining Cisco documentation, see the [Communications, Services, and Additional Information, on page 34](#) section.

For a list of software caveats that apply to Cisco IOS XR Software Release 6.2.1 see the Caveats section. The caveats are updated for every release and are described at <http://www.cisco.com/c/en/us/products/routers/carrier-routing-system/index.html>.

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/c/en/us/support/routers/carrier-routing-system/products-field-notices-list.html>

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), Segment Routing, Hot Standby Router Protocol (HSRP), and Virtual Router Redundancy Protocol (VRRP) features.
- **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 multiple 100K 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.
- **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, 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.
- **IPv6 VPN over IP**—This delivers IPv6 VPN over IP traffic.



Note IPv6 VPN over MPLS and IPv6 VPN over IP won't co-exist

- **Carrier Grade Network Address Translation (CGN)**—This enables services 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, see the Software Features Introduced in Cisco IOS XR Software Release 6.2.1 section in this document.

System Requirements

This section describes the system requirements for Cisco IOS XR Software Release 6.2.1 supported on the Cisco CRS Router.

Feature Set Table

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

Table 1: Cisco IOS XR Software Release 6.2.1 PIE Files

Feature Set	Filename	Description
Composite Package		
Cisco IOS XR IP Unicast Routing Core Bundle	hfr-mini-px.pie-6.2.1	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-6.2.1	Contains the required core packages including OS, Admin, Base, Forwarding, Modular Services Card, Routing, SNMP Agent, and Alarm Correlation.
Optional Individual Packages (Packages are installed individually)		
Cisco IOS XR Manageability Package	hfr-mgbl-px.pie-6.2.1	Common Object Request Broker Architecture (CORBA) agent, Extensible Markup Language (XML) Parser, and HTTP server packages.
Cisco IOS XR MPLS Package	hfr-mpls-px.pie-6.2.1	MPLS Traffic Engineering (MPLS-TE), Label Distribution Protocol (LDP), MPLS Forwarding, MPLS Operations, Administration, and Maintenance (OAM), Link Manager Protocol (LMP), Optical User Network Interface (OUNI), Resource Reservation Protocol (RSVP), and Layer-3 VPN.
Cisco IOS XR Multicast Package	hfr-mcast-px.pie-6.2.1	Multicast Routing Protocols (PIM, Multicast Source Discovery Protocol [MSDP], Internet Group Management Protocol [IGMP], Auto-RP), Tools (SAP, MTrace), and Infrastructure [(Multicast Routing Information Base [MRIB], Multicast-Unicast RIB [MURIB], Multicast forwarding [MFWD]).

Cisco IOS XR Security Package	hfr-k9sec-px.pie-6.2.1	Support for Encryption, Decryption, IP Security (IPSec), Secure Shell (SSH), Secure Socket Layer (SSL), and Public-key infrastructure (PKI) (Software based IPSec support—maximum of 500 tunnels)
Cisco IOS XR Services Package	hfr-services-px.pie-6.2.1	Includes binaries to support CGSE and CGSE PLUS cards.
Cisco IOS XR FPD Package	hfr-fpd-px.pie-6.2.1	Firmware for Fixed Physical layer interface module (PLIM) and Shared port adapters (SPA) modules as well as ROM monitor (ROMMON) images for Cisco CRS chassis.
Cisco IOS XR Diagnostic Package	hfr-diags-px.pie-6.2.1	Diagnostic utilities for Cisco IOS XR routers.
Cisco IOS XR Documentation Package	hfr-doc-px.pie-6.2.1	.man pages for Cisco IOS XR Software on the Cisco CRS chassis.
Cisco IOS XR Video Package	hfr-video-px.pie-6.2.1	Support for Video Monitoring on Cisco CRS routers.
Cisco IOS XR Satellite Package	hfr-asr9000v-nV-px.pie-6.2.1	Includes binaries to support Cisco ASR9000v Series Router Software.
Cisco IOS XR Lawful Intercept (LI) Package	hfr-li-px.pie-6.2.1	Includes LI software images.

This table lists the Cisco IOS XR Software feature set matrix (TAR files) and associated filenames available for the Cisco IOS XR Software Release 6.2.1 supported on the Cisco CRS router.

Table 2: Cisco IOS XR Software Release 6.2.1 TAR Files

Feature Set	Filename	Description
Cisco IOS XR IP/MPLS Core Software	CRS-iosxr-px-6.2.1.tar	<ul style="list-style-type: none"> • Cisco IOS XR IP Unicast Routing Core Bundle • Cisco IOS XR Manageability Package • Cisco IOS MPLS Package • Cisco IOS XR Multicast Package • Cisco IOS XR Diagnostic Package • Cisco IOS XR FPD Package • Cisco IOS XR Lawful Intercept Package • Cisco IOS XR Services Package • Cisco IOS XR Documentation Package • Cisco IOS XR Video Package • Cisco IOS XR Satellite Package
Cisco IOS XR IP/MPLS Core Software 3DES	CRS-iosxr-px-k9-6.2.1.tar	<ul style="list-style-type: none"> • Cisco IOS XR IP Unicast Routing Core Bundle • Cisco IOS XR Manageability Package • Cisco IOS XR MPLS Package • Cisco IOS XR Multicast Package • Cisco IOS XR Security Package • Cisco IOS XR Diagnostic Package • Cisco IOS XR FPD Package • Cisco IOS XR Lawful Intercept Package • Cisco IOS XR Services Package • Cisco IOS XR Documentation Package • Cisco IOS XR Video Package • Cisco IOS XR Satellite 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 6.2.1 consist of the following:

- 6 GB memory on Performance Route Processors (PRPs)

Supported Hardware

The following tables lists the supported hardware components on the Cisco CRS Router and the minimum required software versions. For more information, see the *Firmware Support* section.

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

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-16-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 Modular Power Alarm for 16 slots and FCC	CRS-16-ALARM-C	3.9
Cisco CRS Modular Power Grill For 16 Slots and FCC	CRS-16-PW-GRILL	3.9
Cisco CRS Modular DC Power Shelf for 16 slots LCC	CRS-16LCC-PSH-DC	3.9
Cisco CRS Modular AC Power Shelf for 16 slots LCC	CRS-16LCC-PSH-AC	3.9
Cisco CRS Modular AC Power Module	CRS-PM-AC	3.9
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
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 You must use CRS-8-FANTRAY-B fan tray when CRS-MSC-X, CRS-LSP-X and CRS-FP-X line cards are installed.	4.2.0
Cisco CRS Modular DC Power Shelf for 8 slots Chassis	CRS-8-PSH-DC	3.9

Cisco CRS Modular DC Power Module	CRS-PM-DC	3.9
Cisco CRS Modular AC Power Shelf for 8 slots Chassis	CRS-8-PSH-AC	3.9
Cisco CRS Modular AC Power Module	CRS-PM-AC	3.9
Cisco CRS 8 slot Fan Tray for CRS-8/S-B	CRS-8-FANTRAY-B	--
Cisco CRS Series 4-Slot Line Card Chassis		
Cisco CRS 4-Slot Line Card Chassis	CRS-4-CH	3.4
Cisco CRS 4-Slot AC supply	CRS-4-AC-SUPPLY	3.4
Cisco CRS 4-Slot AC Shelf	CRS-4-AC-SHELF	3.4
Cisco CRS 4 slot Fan Tray	CRS-4-FAN-TR	3.4
Cisco CRS Fabric Chassis Hardware		
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
CRS-1 Fabric Chassis Integrated Switch Controller Card	CRS-FCC-SC-22GE Integrated Switch	3.4.1
Cisco CRS-3 Series Fabric Card Chassis Switch	CRS-FCC-SFC-140	4.0.3
CRS-1 Fabric Chassis Integrated Switch Controller Card - B	CRS-FCC-SC-22GE-B	5.1.3
Cisco CRS-X Fabric Card Chassis Switch Fabric Card (400G)	CRS-FCC-SFC-400	5.1.3
Cisco CRS-X Fabric Card Chassis Switch Fabric Card (400G)-B	CRS-FCC-SFC-400-B	5.3.3 with hfr-px-5.3.3.CRS.tar SMU tar file
Cisco CRS General Chassis Hardware		
Cisco CRS PCMCIA Flash Disk 4 GB	CRS-FLASH-DISK-4G	3.8
Cisco CRS PCMCIA Flash Disk 16 GB	CRS-FLASH-DISK-16G	4.2
Cisco CRS Modular Service 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-3 Label Switch Processor	CRS-LSP	4.3.0
Cisco CRS-X Label Switch Processor	CRS-LSP-X	5.1.2
Cisco CRS Series Modular Services Card 400G	CRS-MSC-X	5.1.1
Cisco CRS Series Forwarding Processor 400G	CRS-FP-X	5.1.1
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 Series 16 Slots Fabric Card / Multi (140G)	CRS-16-FC140/M	4.0.3
Cisco CRS Series 8 Slots Fabric Card / Single Chassis (400G)	CRS-8-FC400/S	5.1.1
Cisco CRS Series 16 Slots Fabric Card / Single Chassis (400G)	CRS-16-FC400/S	5.1.1
Cisco CRS Series 8-Slot Back-to-Back Fabric Card	CRS-8-FC140/M	4.3.1
Cisco CRS-X 16-Slot Line Card Chassis Fabric Card / Multi (400G)	CRS-16-FC400/M	5.1.3
Cisco CRS Series Modular Services Card 200G	CRS-MS-C-X-L	5.1.4
Cisco CRS Series Forwarding Processor 200G	CRS-FP-X-L	5.1.4
Cisco CRS Series 8 Slots Fabric Card / Multi (400G)	CRS-8-FC400/M	5.3.1
Cisco CRS Interface and Route Processor Cards		
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 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 2-port 100-GE and 5-port 40-GE QSFP+combination PLIM	2X100GE-FLEX-40	5.1.3
Cisco CRS Series 4x100GbE LAN/OTN Interface Module	4X100GE-LO	5.1.1
Cisco CRS Series 40x10GbE LAN/WAN/OTN Interface Module	40X10GE-WLO	5.1.1
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 Series 4x40GbE OTU3 Interface Module	4-40GE-L/OTN	4.2.3

Cisco CRS Series 2x40GbE OTU3 Interface Module	2-40GE-L/OTN	4.2.3
Cisco CRS Series 1x100GbE IPoDWDM Interface Module	1-100GE-DWDM/C	4.2.3
Cisco CRS Flexible SPA and 6-port 10GE PLIM	6-10GE-WLO-FLEX	4.3.0
Cisco CRS 80 Gbps Carrier Grade Services Engine PLIM	CRS-CGSE-PLUS	4.3.1
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
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 on CRS1-SIP-800 4.3.1 on 6-10GE-WLO-FLEX
Cisco CRS 2-Port OC-48c/STM-16c POS/RPR Shared Port Adapter	SPA-2XOC48-POS/RPR	3.4 on CRS1-SIP-800 4.3.0 on 6-10GE-WLO-FLEX
Cisco CRS 4-Port OC-48c/STM-16c POS/RPR Shared Port Adapter	SPA-4XOC48-POS/RPR	3.4 on CRS1-SIP-800 4.3.0 on 6-10GE-WLO-FLEX
Cisco CRS 1-Port OC-192c/STM-64c POS/RPR Shared Port Adapter with XFP Optics	SPA-OC192POS-XFP	3.2 on CRS1-SIP-800 4.3.0 on 6-10GE-WLO-FLEX
Cisco CRS 4-Port OC-3c/STM-1c Shared Port Adapter	SPA-4XOC3-POS	3.2 on CRS1-SIP-800 4.3.1 on 6-10GE-WLO-FLEX
Cisco CRS 1-Port OC-192/STM-64 POS/RPR SPA VSR Optics	SPA-OC192POS-VSR	3.4.1 on CRS1-SIP-800
Cisco CRS 4-Port OC-12c/STM-4 Packet over SONET SPA	SPA-4XOC12-POS	4.0.1 on CRS1-SIP-800 4.3.1 on 6-10GE-WLO-FLEX
Cisco CRS 8-Port OC-3c/STM-1 Packet over SONET SPA	SPA-8XOC3-POS	4.0.1 on CRS1-SIP-800 4.3.1 on 6-10GE-WLO-FLEX
Cisco CRS 4-Port OC-3c/STM-1 Packet over SONET SPA	SPA-4XOC3-POS-V2	4.0.1 on CRS1-SIP-800 4.3.2 on 6-10GE-WLO-FLEX

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 on CRS1-SIP-800
1-Port Clear Channel OC-12 ATM SPA	SPA-1XOC12-ATM-V2	3.7 on CRS1-SIP-800
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 on CRS1-SIP-800
Cisco CRS 2-Port Clear Channel T3/E3 Serial Shared Port Adapter	SPA-2XT3/E3	3.4.1 on CRS1-SIP-800
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 on CRS1-SIP-800
Cisco 8-Port Gigabit Ethernet Shared Port Adapter, Version 2	SPA-8X1GE-V2	3.4 on CRS1-SIP-800 4.3.0 on 6-10GE-WLO-FLEX
Cisco 8-Port Gigabit Ethernet Shared Port Adapter	SPA-8X1GE	3.2 on CRS1-SIP-800
Cisco 10-Port Gigabit Ethernet Shared Port Adapter, Version 2	SPA-10X1GE-V2	3.4 on CRS1-SIP-800 4.3.2 on 6-10GE-WLO-FLEX
Cisco 1-Port Ten Gigabit Ethernet Shared Port Adapter, Version 2	SPA-1X10GE-L-V2	3.4 on CRS1-SIP-800 4.3.2 on 6-10GE-WLO-FLEX
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 on CRS1-SIP-800 4.3.2 on 6-10GE-WLO-FLEX
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		
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 IR-2 XFP Module for SMF	XFP-10GZR-OC192LR	3.4
Cisco fixed rate Dense Wavelength-Division Multiplexing XFP Modules	DWDM-XFP-30.33 through DWDM-XFP-59.79	NA
Cisco 10GBASE Dense Wavelength-Division Multiplexing XFP Module	DWDM-XFP-C	4.2.3
10GBASE-SR SFP Module	SFP-10G-SR	5.1.1
10GBASE-SR SFP Module for Extended Temp range	SFP-10G-SR-X	5.1.1
10GBASE-LR SFP Module	SFP-10G-LR	5.1.1
10GBASE-LR SFP Module for Extended Temp range	SFP-10G-LR-X	5.1.1
10GBASE-ER SFP Module	SFP-10G-ER	5.1.1
10GBASE-ZR SFP10G Module for SMF	SFP-10G-ZR	5.1.1
Cisco CRS SFPs and CFPs		
Optics module for 3-Port 100-GE LAN and 1-Port 100-GE IPoDWDM PLIM	ONS-CFP2-WDM	6.1.2
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
100GBASE-LR4 CFP transceiver module for SMF, 1310-nm wavelength, SC duplex connector	CFP-100G-LR4	4.0
100 Gigabit Ethernet over 10 short-reach optical lanes (SR10) optics (multimode fiber)	CFP-100G-SR10	4.2.1
CPAK-100G-LR4 Transceiver module, 10 km SMF	CPAK-100G-LR4	5.1.1
CPAK-100G-SR10 Transceiver module, 100 m OM3 MMF	CPAK-100G-SR10	5.1.1
CPAK optical transceiver module, 100GBASE-SR4, 100m OM4	CPAK-100G-SR4	6.1.2
100-Gigabit Ethernet C Form-factor Pluggable (CFP) optics module - CFP-100G-ER4	CFP-100G-ER4	5.1.2
40-Gigabit Ethernet C Form-factor Pluggable (CFP) optics module - 40GBASE-LR4	CFP-40G-LR4	4.2.3
40-Gigabit Ethernet C Form-factor Pluggable (CFP) optics module - 40GBASE-SR4	CFP-40G-SR4	4.2.3
40-Gigabit Ethernet C Form-factor Pluggable (CFP) optics module - 40GBASE-FR	CFP-40G-FR	4.2.3
Cisco 40GBASE-SR4 QSFP Module	QSFP-40G-SR4	5.1.3
Cisco 40GBASE-LR4 QSFP Module	QSFP-40G-LR4	5.1.3
Cisco 40GBASE-ER4 QSFP Module	QSFP-40G-ER4	5.3.1

- For all slots (except slots 1 & 6): 24 ports of 10GE ER per 24x10GE LC
- For slots 1 & 6: 12 ports of 10GE ER and remaining 12 ports of SR/LR per 24x10GE LC



Note This is applicable at 40 degrees C.

Hardware Not Supported

The following hardware are not supported:

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
Cisco CRS 8-Slot Route Processor	CRS-8-RP
Cisco CRS-1 16-slot Route Processor, revision B	CRS-16-RP-B



Note

- The fixed configuration DC power system is not supported for CRS-X 8-slot legacy chassis (CRS-8-LCC) and CRS-X 16-slot single/multichassis system legacy chassis (CRS-16-LCC). We recommend to replace the fixed configuration DC power system with modular configuration DC power system. The product ID for modular DC power systems are CRS-8-DCKIT-M= and CRS-16-DCKIT-M= respectively for 8 slots system and 16 slots system.
- CRS supports PRP for all Single chassis and Multichassis 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/prod/collateral/routers/ps5763/end_of_life_notice_c51-695816.html
http://www.cisco.com/en/US/prod/collateral/routers/ps5763/end_of_life_notice_c51-695817.html
- Cisco Session Border Controller (SBC) is not supported. Cisco IOS XR Software Release 3.7 is the last release that supports SBC.
- Cisco CRS-1 Series Forwarding Processor 40G (CRS-FP40) is not supported on Cisco CRS 16-Slot chassis.

CRS-FP140 Licenses

The following licenses apply to the CRS-FP140:

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 Multichassis License 140G

CRS-FP140 also supports eDelivery licenses, which can be downloaded as the License Certificates in PDF format.

eDelivery PID	Description
L-XC-ENH-NF-140G=	Cisco CRS Series Enhanced NetFlow License 140G

L-XC-RTE-SCL-140G=	Cisco CRS Series Route Scale License 140G
L-XC-MC-LIC-140G=	Cisco CRS Series Multichassis License 140G
L-XC-TE-SCL-140G=	Cisco CRS Series Traffic Engineering Scale License 140G
L-XC-L2L3VPN-140G=	Cisco CRS Series L2 L3 VPN Peering Edge License 140G

CRS-FP400G Licenses

The following licenses apply to the CRS-FP400G:

Licence	Description
XC-ENH-NF-400G	Cisco CRS Series Enhanced Netflow Performance License 400G
XC-L2L3VPN-400G	Cisco CRS Series L2 and L3 VPN Peering Edge License 400G
XC-RTE-SCL-400G	Cisco CRS Series Route Scale License 400G
XC-TE-SCL-400G	Cisco CRS Series Traffic Engineering Scale License 400G

CRS-FP400G also supports eDelivery licenses, which can be downloaded as the License Certificates in PDF format.

For further information or questions, please visit <http://www.cisco.com/web/partners/tools/edelivery.html>.

eDelivery PID	Description
L-XC-ENH-NF-400G=	Cisco CRS Series Enhanced NetFlow License 400G
L-XC-RTE-SCL-400G=	Cisco CRS Series Route Scale License 400G
L-XC-TE-SCL-400G=	Cisco CRS Series Traffic Engineering Scale License 400G
L-XC-L2L3VPN-400G=	Cisco CRS Series L2 L3 VPN Peering Edge License 400G

Software Compatibility

Cisco IOS XR Software Release 6.2.1 is compatible with the following Cisco CRS-1 and CRS-3 systems:

- Cisco CRS 4-Slot Single Chassis System
- Cisco CRS 8-Slot Single Chassis System
- Cisco CRS 16-Slot Single Chassis System
- Cisco CRS Multichassis Systems

Cisco IOS XR Software Release 6.2.1 is compatible with the following Cisco CRS-3 system:

- Cisco CRS-3 Multichassis System, maximum configuration of 8+2
- Cisco CRS-3 16-slot Back-to-Back System
- Cisco CRS-3 8-slot Back-to-Back System

Cisco IOS XR Software Release 6.2.1 is compatible with the following Cisco CRS-X systems:

- Cisco CRS 8-Slot Single Chassis System. You must use CRS-8-FANTRAY-B fan tray with Cisco CRS-X system.
- Cisco CRS 16-Slot Single Chassis System
- Cisco CRS-X Multichassis System, maximum configuration of 8+2
- Cisco CRS-X 16-slot Back-to-Back System
- Cisco CRS-X 8-slot Back-to-Back System

Minimum Firmware Requirement

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

After completing an RMA, upgrade the firmware as per the matrix in this link, which also links to PDF copies of the IOS XR Firmware Upgrade Guides	http://www.cisco.com/web/Cisco_IOS_XR_Software/index.html
For the upgrade CLI, refer to the <i>Hardware Redundancy and Node Administration Commands on Cisco IOS XR Software</i> chapter of the <i>Cisco IOS XR System Management Command Reference for the Cisco CRS router</i>	http://www.cisco.com/en/US/products/ps5763/prod_command_reference_list.html



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.

Determining Installed Committed Packages

To determine the committed Cisco IOS XR Software packages installed on your router, log in to the router and enter the **show install committed summary** command

```
RP/0/RP0/CPU0:router# show install committed summary
```

```
Default Profile:
Admin Resources
SDRs:
  Owner
Committed Packages:
disk0:hfr-asr9000v-nV-px-6.2.1
disk0:hfr-diags-px-6.2.1
disk0:hfr-doc-px-6.2.1
disk0:hfr-fpd-px-6.2.1
disk0:hfr-k9sec-px-6.2.1
disk0:hfr-li-px-6.2.1
disk0:hfr-mcast-px-6.2.1
disk0:hfr-mgbl-px-6.2.1
disk0:hfr-mini-px-6.2.1
disk0:hfr-mps-px-6.2.1
```

disk0:hfr-services-px-6.2.1
disk0:hfr-video-px-6.2.1

Software Features Introduced in Cisco IOS XR Software Release 6.2.1

AAA Password Security for FIPS Compliance

Cisco IOS XR Software introduces advanced AAA password strengthening policy and security mechanism to store, retrieve and provide rules or policy to specify user passwords. This password policy is applicable only for local users, and not for remote users whose profile information are stored in a third party AAA server. This policy is not applicable to secrets of the user. If both secret and password are configured for a user, then secret takes precedence, and password security policy does not have any effect on authentication or change of password for such users. This AAA password security policy works as such for Cisco IOS XR platforms. Whereas, this feature is supported only on XR VM, for Cisco IOS XR 64 bit platforms.

For more information about this feature, see the *Configuring AAA Services* chapter in the *System Security Configuration Guide for Cisco CRS Routers*. For complete command reference, see the *Authentication, Authorization, and Accounting* chapter in the *System Security Command Reference for Cisco CRS Routers*.

Support for HTTP(s) Protocol for Install Manager and Copy Command

Support for HTTP(s) protocol is extended for install manager and copy command.

For more information on HTTP(s) protocol support for these commands, refer *File System Commands* and *Software Package Management Commands* chapters in *Cisco ASR 9000 Series Aggregation Services Router System Management Command Reference, Release 6.2.x*

Software Feature Enhancements in Cisco IOS XR Software Release 6.2.1

Security Enhancements

This release addresses following Cisco Product Security Incident Response Team (PSIRT) caveats:

- [CSCux80653](#)
- [CSCux80646](#)

Hardware Features and Enhancements Introduced in Cisco IOS XR Software 6.2.1

There are no new hardware features introduced in this release.

System Admin Process Management Commands

This section lists the advanced manageability commands that are made available in Cisco IOS XR Software Release 6.2.1. To view these commands you must first execute the **activate advanced** command in sysadmin-vm mode.



Note WARNING: Do not use the advanced manageability commands unless instructed specifically by TAC or any other Cisco support executive. They may instruct you to use this command when debugging specific process management issues.

- **show pm info location all**—This command allows you to view highly detailed process manager information for all node locations. With the details, you can debug process manager issues.

```
sysadmin-vm:# show pm info location all
Sun Aug 6 22:07:48.849 UTC
-----
node:      0/RP0
-----
                Node IP address: 192.168.1.1
                PM Start Time Stamp: 08/02/2017 23:04:09.000
Mandatory process down state: N
vm-manager connection up: Y
wdmon connection up: Y
Last wdmon connect timestamp: 08/02/2017 23:04:11.000
                Num wdmon connects: 1
-----
node:      0/RP1
-----
                Node IP address: 192.168.4.1
                PM Start Time Stamp: 08/02/2017 23:08:19.000
Mandatory process down state: N
vm-manager connection up: Y
wdmon connection up: Y
Last wdmon connect timestamp: 08/02/2017 23:08:21.000
                Num wdmon connects: 1
-----
```

- **process <action> <process-name> location all**—This command allows you to take a specific action on a given process on all nodes simultaneously. To know what actions can be performed, use online help function (?).

```
sysadmin-vm:0_RP0# process ?
Possible completions:
crash          crash a process
heartbeat      Control heartbeat check for a process
mandatory      toggle mandatory setting
restart         restart a process
shutdown       kill/stop a process
start          start a process
```



Note WARNING: Do not use this command unless instructed specifically by TAC or any other Cisco support executive. They may instruct you to use this command when debugging specific process management issues.

In this example the **restart** action is performed on the **cm** process for all node locations:

```
sysadmin-vm:# process restart cm location all
Sun Aug 6 22:09:50.897 UTC
proc-action-status User root (200.0.0.1) requested restart for process cm(0) at 0/RP0 'Sending signal 15
to process cm(IID 0) pid=3714'

proc-action-status User root (200.0.0.1) requested restart for process cm(0) at 0/RP1 'Sending signal 15
to process cm(IID 0) pid=3676'
```

```

sysadmin-vm:0_RP0# 0/RP0/ADMIN0:Aug 6 22:09:51.027 : pm[3651]: %INFRA-Process_Manager-3-PROCESS_RESTART
: Process cm (IID: 0) restarted
0/RP1/ADMIN0:Aug 6 22:14:03.014 : pm[3613]: %INFRA-Process_Manager-3-PROCESS_RESTART : Process cm (IID:
0) restarted

```

- **process heartbeat disable** *<process-id>* **location** *<node-id>*—This command stops the heartbeat monitoring by the process manager for a process at a specified node location. If a process hangs or is blocked internally, it will not be automatically restarted, unless explicitly done by the **sysadmin-vm:# process restart** *<process-name>* command.



Note WARNING: Do not use this command unless instructed specifically by TAC or any other Cisco support executive. They may instruct you to use this command when debugging specific process management issues.

In this example heartbeat check is disabled for the **cm** process at **0/RP1** node location:

```

sysadmin-vm:# process heartbeat disable cm location 0/RP1
Sun Aug 6 22:04:13.764 UTC
proc-action-status User root (200.0.0.1) requested disable heartbeat for process cm(0) at 0/RP1

```

Firmware Support

To check the firmware code running on the Cisco CRS Router, run the **show fpd package** command in admin mode.

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

```

=====
                          Field Programmable Device Package
                          =====

```

Card Type	FPD Description	Type	Subtype	SW Version	Min Req SW Ver	Min Req HW Vers
PRP	FPGA ZJF uBlaze	lc	fpga2	0.01	0.00	0.0
	S-8 FPGA Nirvana	lc	fpga3	14.00	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
	FPGA CPU ZJF	lc	fpga1	7.00	0.00	0.0
	ROMMONA swv2.11 x86mp	lc	rommonA	2.11	2.10	0.0
	ROMMONB swv2.11 x86mp	lc	rommon	2.11	2.11	0.0
PRP	FPGA ZJF uBlaze	lc	fpga2	0.01	0.00	0.0
	S-16 FPGA Nirvana	lc	fpga3	14.00	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 swv2.11 x86mp	lc	rommonA	2.11	2.10	0.0
	ROMMONB swv2.11 x86mp	lc	rommon	2.11	2.11	0.0
SC-B	FPGA SARVA	lc	fpga2	2.26	0.00	0.0
	FPGA CPU 0.15	lc	fpga1	0.15	0.00	0.0
	ROMMONA swv2.11 kensho	lc	rommonA	2.11	2.10	0.0
	ROMMONB swv2.11 kensho	lc	rommon	2.11	2.11	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 swv2.11 spb	lc	rommonA	2.11	2.10	0.0
	ROMMONB swv2.11 spb	lc	rommon	2.11	2.11	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 swv2.11 spb	lc	rommonA	2.11	2.10	0.0
	ROMMONB swv2.11 spb	lc	rommon	2.11	2.11	0.0

Fabric HS123 Superstar	FPGA 4.00	lc	fpga2	4.00	0.00	0.0
	FPGA 6.04 spb	lc	fpga1	6.04	0.00	0.0
	ROMMONA swv2.11 spb	lc	rommonA	2.11	2.10	0.0
	ROMMONB swv2.11 spb	lc	rommon	2.11	2.11	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 swv2.11 spb	lc	rommonA	2.11	2.10	0.0
	ROMMONB swv2.11 spb	lc	rommon	2.11	2.11	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 swv2.11 spb	lc	rommonA	2.11	2.10	0.0
	ROMMONB swv2.11 spb	lc	rommon	2.11	2.11	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 swv2.11 spb	lc	rommonA	2.11	2.10	0.0
	ROMMONB swv2.11 spb	lc	rommon	2.11	2.11	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 swv2.11 spb	lc	rommonA	2.11	2.10	0.0
	ROMMONB swv2.11 spb	lc	rommon	2.11	2.11	0.0
	RXPOD swvF034 spb	lc	rxpod	0.52	0.00	0.0
	TXPOD swvF039 spb	lc	txpod	0.57	0.00	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 swv2.11 spb	lc	rommonA	2.11	2.10	0.0
	ROMMONB swv2.11 spb	lc	rommon	2.11	2.11	0.0
	RXPOD swvF034 spb	lc	rxpod	0.52	0.00	0.0
	TXPOD swvF039 spb	lc	txpod	0.57	0.00	0.0

140G-HS1S3-1	FPGA 4.02	lc	fpga2	4.02	0.00	0.0
	FPGA 6.04 spb	lc	fpga1	6.04	0.00	0.0
	ROMMONA swv2.11 spb	lc	rommonA	2.11	2.10	0.0
	ROMMONB swv2.11 spb	lc	rommon	2.11	2.11	0.0
	RXPOD swvF034 spb	lc	rxpod	0.52	0.00	0.0
	TXPOD swvF039 spb	lc	txpod	0.57	0.00	0.0

400G-S1S2S3	FPGA 0.35	lc	fpga2	0.35	0.00	0.0
	FPGA 1.04 spc	lc	fpga1	1.04	0.00	0.0
	ROMMONA swv2.11 spc	lc	rommonA	2.11	2.10	0.0
	ROMMONB swv2.11 spc	lc	rommon	2.11	2.11	0.0

Fabric HS123 Sapir	FPGA 0.35	lc	fpga2	0.35	0.00	0.0
	FPGA 1.04 spc	lc	fpga1	1.04	0.00	0.0
	ROMMONA swv2.11 spc	lc	rommonA	2.11	2.10	0.0
	ROMMONB swv2.11 spc	lc	rommon	2.11	2.11	0.0

400G-S1S3	FPGA 0.35	lc	fpga2	0.35	0.00	0.0
	FPGA 1.04 spc	lc	fpga1	1.04	0.00	0.0
	ROMMONA swv2.11 spc	lc	rommonA	2.11	2.10	0.0
	ROMMONB swv2.11 spc	lc	rommon	2.11	2.11	0.0

Fabric HS13 Sapir	FPGA 0.35	lc	fpga2	0.35	0.00	0.0
	FPGA 1.04 spc	lc	fpga1	1.04	0.00	0.0

	ROMMONA swv2.11 spc	lc	rommonA	2.11	2.10	0.0
	ROMMONB swv2.11 spc	lc	rommon	2.11	2.11	0.0
S2	FPGA 0.25	lc	fpga2	0.25	0.00	0.0
	FPGA 0.10	lc	fpga3	0.10	0.00	0.0
	FPGA 1.04 spc	lc	fpga1	1.04	0.00	0.0
	ROMMONA swv2.11 spc	lc	rommonA	2.11	2.10	0.0
	ROMMONB swv2.11 spc	lc	rommon	2.11	2.11	0.0
140G-MS	FPGA Linecard 0.36	lc	fpga2	0.36	0.00	0.0
	FPGA CPU 0.10	lc	fpga1	0.10	0.00	0.0
	ROMMONA swv2.11 kensho	lc	rommonA	2.11	2.10	0.0
	ROMMONB swv2.11 kensho	lc	rommon	2.11	2.11	0.0
FP-140G	FPGA Linecard 0.36	lc	fpga2	0.36	0.00	0.0
	FPGA CPU 0.10	lc	fpga1	0.10	0.00	0.0
	ROMMONA swv2.11 kensho	lc	rommonA	2.11	2.10	0.0
	ROMMONB swv2.11 kensho	lc	rommon	2.11	2.11	0.0
CRS-LSP	FPGA Linecard 0.36	lc	fpga2	0.36	0.00	0.0
	FPGA CPU 0.10	lc	fpga1	0.10	0.00	0.0
	ROMMONA swv2.11 kensho	lc	rommonA	2.11	2.10	0.0
	ROMMONB swv2.11 kensho	lc	rommon	2.11	2.11	0.0
400G-MS	FPGA Linecard 0.53	lc	fpga2	0.53	0.00	0.0
	FPGA CPU 0.15	lc	fpga1	0.15	0.00	0.0
	ROMMONA swv2.11 kensho	lc	rommonA	2.11	2.10	0.0
	ROMMONB swv2.11 kensho	lc	rommon	2.11	2.11	0.0
FP-400G	FPGA Linecard 0.53	lc	fpga2	0.53	0.00	0.0
	FPGA CPU 0.15	lc	fpga1	0.15	0.00	0.0
	ROMMONA swv2.11 kensho	lc	rommonA	2.11	2.10	0.0
	ROMMONB swv2.11 kensho	lc	rommon	2.11	2.11	0.0
LSP-400G	FPGA Linecard 0.53	lc	fpga2	0.53	0.00	0.0
	FPGA CPU 0.15	lc	fpga1	0.15	0.00	0.0
	ROMMONA swv2.11 kensho	lc	rommonA	2.11	2.10	0.0
	ROMMONB swv2.11 kensho	lc	rommon	2.11	2.11	0.0
200G-MS	FPGA Linecard 0.53	lc	fpga2	0.53	0.00	0.0
	FPGA CPU 0.15	lc	fpga1	0.15	0.00	0.0
	ROMMONA swv2.11 kensho	lc	rommonA	2.11	2.10	0.0
	ROMMONB swv2.11 kensho	lc	rommon	2.11	2.11	0.0
FP-200G	FPGA Linecard 0.53	lc	fpga2	0.53	0.00	0.0
	FPGA CPU 0.15	lc	fpga1	0.15	0.00	0.0
	ROMMONA swv2.11 kensho	lc	rommonA	2.11	2.10	0.0
	ROMMONB swv2.11 kensho	lc	rommon	2.11	2.11	0.0
10C768-ITU/C	OPTICS FIRMWARE 110B10	lc	fpga2	110.10	0.00	0.0
10C768-DWDM-L	OPTICS FIRMWARE 110B10	lc	fpga2	110.10	0.00	0.0
10C768-DPSK/C	OPTICS FIRMWARE 110B14	lc	fpga2	110.14	0.00	0.0
10C768-DPSK/C-O	OPTICS FIRMWARE 110B14	lc	fpga2	110.14	0.00	0.0
10C768-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

2-40GBE-OTN	PLIM FPGA 32	1c	fpga3	32.00	0.00	0.0
1-100GBE-DWDM	PLIM FPGA 32.0	1c	fpga3	32.00	0.00	0.0
	OPTICS FIRMWARE 5.05	1c	fpga4	5.05	0.00	0.0
4-40GBE-OTN	PLIM FPGA 32	1c	fpga3	32.00	0.00	0.0
6-10GE-WLO-FLEX	OBI FPGA 31.0	1c	fpga3	31.00	0.00	0.0
	TORBAY FPGA 45.0	1c	fpga4	45.00	0.00	0.0
CRS-CGSE-PLUS-PLIM	PLIM FPGA 0.03	1c	fpga3	0.4107	0.00	0.0
	FPGA XLP 0.301	1c	fpga4	0.301	0.00	0.0
40-10GbE	NUGGET FPGA 37.0	1c	fpga3	37.00	0.00	0.0
	GEM0 FPGA 4.0	1c	fpga4	4.00	0.00	0.0
	GEM1 FPGA 4.0	1c	fpga5	4.00	0.00	0.0
4-100GbE	NUGGET FPGA 37.0	1c	fpga3	37.00	0.00	0.0
2x100GE_5x40GE	NUGGET FPGA 37.0	1c	fpga3	37.00	0.00	0.0
	GEM0 FPGA 4.0	1c	fpga4	4.00	0.00	0.0
400G_DWDM_FLEX	Amethyst FPGA 8.0	1c	fpga3	8.00	0.00	0.0
	CAMEO FPGA 66.0	1c	fpga4	66.00	0.00	0.0
	CAMEO FPGA 1.0	1c	fpga5	1.00	0.00	0.0
	ETNA ASIC 3.62	1c	fpga6	3.62	0.00	0.0
	CFP2 OPTICS 5.23	1c	fpga8	5.23	0.00	0.0
20-10GBE	PLIM FPGA 42.0	1c	fpga3	42.00	0.00	0.0
12-10GBE	PLIM FPGA 42.0	1c	fpga3	42.00	0.00	0.0
1-100GBE	PLIM FPGA 19.0	1c	fpga3	19.00	0.00	0.0
	RX MAC FPGA 52.0	1c	fpga4	52.00	0.00	0.0
	TX MAC FPGA 39.0	1c	fpga5	39.00	0.00	0.0
14-10GBE	PLIM FPGA 42.0	1c	fpga3	42.00	0.00	0.0
DRP_B	FPGA 6.04 spb	1c	fpga1	6.04	0.00	0.0
	ROMMONA swv2.11 asmp	1c	rommonA	2.11	2.10	0.0
	ROMMONA swv2.11 dsmp	1c	rommonA	2.11	2.10	0.0
	ROMMONA swv2.11 sp	1c	rommonA	2.11	2.10	0.0
	ROMMONA swv2.11 spb	1c	rommonA	2.11	2.10	0.0
	ROMMONB swv2.11 asmp	1c	rommon	2.11	2.11	0.0
	ROMMONB swv2.11 dsmp	1c	rommon	2.11	2.11	0.0
	ROMMONB swv2.11 sp	1c	rommon	2.11	2.11	0.0
	ROMMONB swv2.11 spb	1c	rommon	2.11	2.11	0.0
MSC_B	FPGA 6.04 spb	1c	fpga1	6.04	0.00	0.0
	ROMMONA swv2.11 asmp	1c	rommonA	2.11	2.10	0.0
	ROMMONA swv2.11 dsmp	1c	rommonA	2.11	2.10	0.0
	ROMMONA swv2.11 sp	1c	rommonA	2.11	2.10	0.0
	ROMMONA swv2.11 spb	1c	rommonA	2.11	2.10	0.0
	ROMMONB swv2.11 asmp	1c	rommon	2.11	2.11	0.0
	ROMMONB swv2.11 dsmp	1c	rommon	2.11	2.11	0.0
	ROMMONB swv2.11 sp	1c	rommon	2.11	2.11	0.0
	ROMMONB swv2.11 spb	1c	rommon	2.11	2.11	0.0
FP40	FPGA 6.04 spb	1c	fpga1	6.04	0.00	0.0
	ROMMONA swv2.11 asmp	1c	rommonA	2.11	2.10	0.0
	ROMMONA swv2.11 dsmp	1c	rommonA	2.11	2.10	0.0
	ROMMONA swv2.11 sp	1c	rommonA	2.11	2.10	0.0
	ROMMONA swv2.11 spb	1c	rommonA	2.11	2.10	0.0

	ROMMONB swv2.11 asmp	lc	rommon	2.11	2.11	0.0
	ROMMONB swv2.11 dsmp	lc	rommon	2.11	2.11	0.0
	ROMMONB swv2.11 sp	lc	rommon	2.11	2.11	0.0
	ROMMONB swv2.11 spb	lc	rommon	2.11	2.11	0.0
CRS1-SIP-800	JACKET FPGA swv6.0	lc	fpga1	6.00	5.00	0.0
	FPGA swv6.0 hww80	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 hww0.80	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 hww0.80	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 hww0.80	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 swv2.11 sp	lc	rommonA	2.11	2.10	0.0
	ROMMONA swv2.11 spb	lc	rommonA	2.11	2.10	0.0
	ROMMONB swv2.11 sp	lc	rommon	2.11	2.11	0.0
	ROMMONB swv2.11 spb	lc	rommon	2.11	2.11	0.0
CRS-16-ALARM-B	FPGA 6.05 spb	lc	fpga1	6.05	0.00	0.0
	ROMMONA swv2.11 spb	lc	rommonA	2.11	2.10	0.0
	ROMMONB swv2.11 spb	lc	rommon	2.11	2.11	0.0
CRS-16-FAN-CT	FPGA 6.04 spb	lc	fpga1	6.04	0.00	0.0
	ROMMONA swv2.11 spb	lc	rommonA	2.11	2.10	0.0
	ROMMONB swv2.11 spb	lc	rommon	2.11	2.11	0.0
CRS-16-LCC-F-CT-B	FPGA 6.04 spb	lc	fpga1	6.04	0.00	0.0
	ROMMONA swv2.11 spb	lc	rommonA	2.11	2.10	0.0
	ROMMONB swv2.11 spb	lc	rommon	2.11	2.11	0.0
CRS-FCC-LED	FPGA 6.04 spb	lc	fpga1	6.04	0.00	0.0
	ROMMONA swv2.11 sp	lc	rommonA	2.11	2.10	0.0
	ROMMONA swv2.11 spb	lc	rommonA	2.11	2.10	0.0
	ROMMONB swv2.11 sp	lc	rommon	2.11	2.11	0.0
	ROMMONB swv2.11 spb	lc	rommon	2.11	2.11	0.0
Route Processor	ROMMONA swv2.11 asmp	lc	rommonA	2.11	2.10	0.0
	ROMMONA swv2.11 dsmp	lc	rommonA	2.11	2.10	0.0
	ROMMONB swv2.11 asmp	lc	rommon	2.11	2.11	0.0
	ROMMONB swv2.11 dsmp	lc	rommon	2.11	2.11	0.0
SC	ROMMONA swv2.11 asmp	lc	rommonA	2.11	2.10	0.0
	ROMMONA swv2.11 dsmp	lc	rommonA	2.11	2.10	0.0
	ROMMONB swv2.11 asmp	lc	rommon	2.11	2.11	0.0
	ROMMONB swv2.11 dsmp	lc	rommon	2.11	2.11	0.0
RP	ROMMONA swv2.11 asmp	lc	rommonA	2.11	2.10	0.0
	ROMMONA swv2.11 dsmp	lc	rommonA	2.11	2.10	0.0
	ROMMONB swv2.11 asmp	lc	rommon	2.11	2.11	0.0

	ROMMONB swv2.11 dsmp	lc	rommon	2.11	2.11	0.0
Shelf Controller GE	ROMMONA swv2.11 asmp	lc	rommonA	2.11	2.10	0.0
	ROMMONA swv2.11 dsmp	lc	rommonA	2.11	2.10	0.0
	ROMMONB swv2.11 asmp	lc	rommon	2.11	2.11	0.0
	ROMMONB swv2.11 dsmp	lc	rommon	2.11	2.11	0.0
RP	ROMMONA swv2.11 asmp	lc	rommonA	2.11	2.10	0.0
	ROMMONA swv2.11 dsmp	lc	rommonA	2.11	2.10	0.0
	ROMMONB swv2.11 asmp	lc	rommon	2.11	2.11	0.0
	ROMMONB swv2.11 dsmp	lc	rommon	2.11	2.11	0.0
Shelf Controller GE22	ROMMONA swv2.11 asmp	lc	rommonA	2.11	2.10	0.0
	ROMMONA swv2.11 dsmp	lc	rommonA	2.11	2.10	0.0
	ROMMONB swv2.11 asmp	lc	rommon	2.11	2.11	0.0
	ROMMONB swv2.11 dsmp	lc	rommon	2.11	2.11	0.0
DRP	ROMMONA swv2.11 asmp	lc	rommonA	2.11	2.10	0.0
	ROMMONA swv2.11 dsmp	lc	rommonA	2.11	2.10	0.0
	ROMMONA swv2.11 sp	lc	rommonA	2.11	2.10	0.0
	ROMMONB swv2.11 asmp	lc	rommon	2.11	2.11	0.0
	ROMMONB swv2.11 dsmp	lc	rommon	2.11	2.11	0.0
	ROMMONB swv2.11 sp	lc	rommon	2.11	2.11	0.0
S1S2S3	ROMMONA swv2.11 sp	lc	rommonA	2.11	2.10	0.0
	ROMMONB swv2.11 sp	lc	rommon	2.11	2.11	0.0
S1S3	ROMMONA swv2.11 sp	lc	rommonA	2.11	2.10	0.0
	ROMMONB swv2.11 sp	lc	rommon	2.11	2.11	0.0
S2	ROMMONA swv2.11 sp	lc	rommonA	2.11	2.10	0.0
	ROMMONB swv2.11 sp	lc	rommon	2.11	2.11	0.0
Fabric HS123	ROMMONA swv2.11 sp	lc	rommonA	2.11	2.10	0.0
	ROMMONB swv2.11 sp	lc	rommon	2.11	2.11	0.0
Fabric QQS123	ROMMONA swv2.11 sp	lc	rommonA	2.11	2.10	0.0
	ROMMONB swv2.11 sp	lc	rommon	2.11	2.11	0.0
LED	ROMMONA swv2.11 sp	lc	rommonA	2.11	2.10	0.0
	ROMMONB swv2.11 sp	lc	rommon	2.11	2.11	0.0
40G-MSC	ROMMONA swv2.11 asmp	lc	rommonA	2.11	2.10	0.0
	ROMMONA swv2.11 dsmp	lc	rommonA	2.11	2.10	0.0
	ROMMONA swv2.11 sp	lc	rommonA	2.11	2.10	0.0
	ROMMONB swv2.11 asmp	lc	rommon	2.11	2.11	0.0
	ROMMONB swv2.11 dsmp	lc	rommon	2.11	2.11	0.0
	ROMMONB swv2.11 sp	lc	rommon	2.11	2.11	0.0
CRS-16-ALARM	ROMMONA swv2.11 sp	lc	rommonA	2.11	2.10	0.0
	ROMMONB swv2.11 sp	lc	rommon	2.11	2.11	0.0
CRS-16-LCC-FAN-CT	ROMMONA swv2.11 sp	lc	rommonA	2.11	2.10	0.0
	ROMMONB swv2.11 sp	lc	rommon	2.11	2.11	0.0
FC Fan Controller	ROMMONA swv2.11 sp	lc	rommonA	2.11	2.10	0.0
	ROMMONB swv2.11 sp	lc	rommon	2.11	2.11	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-OC192POS-XFP	SPA FPGA swv1.101 hwv3	spa fpga2	1.101	0.00	3.0
	SPA FPGA swv1.2	spa fpga1	1.02	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-1XOC12-POS	SPA FPGA swv3.4	spa fpga1	3.04	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

Important Notes

- From Release 6.0, the onePK toolkit is not supported.
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- Default timestamp setting—The timestamp prompt that precedes console output is enabled by default. 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*.
- Country-specific laws, regulations, and licenses—In certain countries, use of these products may be prohibited and subject to laws, regulations, or licenses, including requirements applicable to the use of the products under telecommunications and other laws and regulations; customers must comply with all such applicable laws in the countries in which they intend to use the products.
- Field replaceable unit (FRU) removal—For all card removal and replacement (including fabric cards, line cards, fan controller, and RP) follow the instructions provided by Cisco to avoid impact to traffic. See the *Cisco 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 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. This CLI needs to be turned on under IGP (OSPF/ISIS) under the respective AFI.
- 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—Starting 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
```

- When upgrading a system from a release prior to 3.8.4, 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-mpi dependent (Nonreload) SMU fails—Backing out the non reload os-mpi 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 *MPLS Configuration Guide for the Cisco CRS Routers*.

- 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 and CRS-X routers:

- **show environment**
- **hw-module reload**
- **show controllers egressq client location** <>
- **show controllers egressq queue drr [max | min] location** <>
- **show controllers egressq queue drr [max | min] location** <>
- **show controllers egressq group ntb [max | min] location** <>
- **show controllers egressq port bmap 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

- 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

DWDM Configuration Management



Note This section describes 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 and CRS-3 routers, 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

This change affects all models of the following hardware on the Cisco CRS-3 router:

- Cisco 1-Port 100GE OTU4 IPoDWDM PLIM
- Cisco 4-Port 40-GE OTU3 OTN/LAN PLIM
- Cisco 2-Port 40-GE OTU3 OTN/LAN PLIM

The **g709 fec high-gain** and **g709 fec long-haul** commands are added under DWDM configuration to configure the new high-gain FEC mode and long-haul FEC mode for Cisco 1-Port 100GE OTU4 IPoDWDM PLIM.

The following is an example of configuring the **g709 fec high-gain** command under DWDM configuration to configure the new high-gain FEC mode:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# controller dwdm <>
RP/0/RP0/CPU0:router(config)# g709 fec high-gain
RP/0/RP0/CPU0:router(config)# commit
```

The following is an example of configuring the **g709 fec long-haul** command under DWDM configuration to configure the new long-haul FEC mode:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# g709 fec long-haul
RP/0/RP0/CPU0:router(config)# commit
```

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
```

Caveats

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

This section contains caveats that are generic to the Cisco IOS XR Software Release 6.2.1 and those specific to the Cisco CRS-1 router and the Cisco CRS-3 router.

Cisco IOS XR Caveats

Table 4: Cisco IOS XR Caveats

Identifier	Description
CSCvc89910	Tunnel stuck in RSVP Signaling Proceeding
CSCvb63427	Sysadmin config loss on staggered double RP failover

Identifier	Description
CSCvf07863	Yang query for interfaces with openconfig-lacp fetches data for all interfaces

Caveats Specific to the Cisco CRS-1 Router

There are no caveats in this release.

Caveats Specific to the Cisco CRS-3 Router

There are no caveats in this release.

Caveats Specific to the Cisco CRS-X Router

There are no caveats in this release.

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.

Migrating Cisco CRS-1 to 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 URL

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

Migrating Cisco CRS-1 and CRS-3 to CRS-X

For information about migrating from a Cisco CRS-1 and Cisco CRS-3 to a Cisco CRS-X chassis, refer to the URL

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

Troubleshooting

For information on troubleshooting Cisco IOS XR Software, see 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:

<https://www.cisco.com/c/en/us/support/routers/carrier-routing-system/products-installation-guides-list.html>

The Cisco IOS XR Software documentation set includes the Cisco IOS XR software configuration guides and command references.

- The configuration guides are located at this URL:

<https://www.cisco.com/c/en/us/support/routers/carrier-routing-system/products-installation-and-configuration-guides-list.html>

- The command reference guides are located at this URL:

<https://www.cisco.com/c/en/us/support/routers/carrier-routing-system/products-command-reference-list.html>

<https://www.cisco.com/c/en/us/support/routers/carrier-routing-system/tsd-products-support-series-home.html>

The document containing Cisco IOS XR System Error Messages (SEM) is located at this URL:

https://www.cisco.com/c/en/us/td/docs/ios_xr_sw/error/message/ios-xr-sem-guide.html

Production Software Maintenance Updates (SMUs)

A production SMU is a SMU that is formally requested, developed, tested, and released. Production SMUs are intended for use in a live network environment and are formally supported by the Cisco TAC and the relevant development teams. Software bugs identified through software recommendations or Bug Search Tools are not a basis for production SMU requests.

For information on production SMU types, refer the [Production SMU Types](#) section of the [IOS XR Software Maintenance Updates \(SMUs\)](#) guide.

Communications, Services, and Additional Information

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- To find warranty information for a specific product or product family, access [Cisco Warranty Finder](#).

Cisco Bug Search Tool

[Cisco Bug Search Tool](#) (BST) is a web-based tool that acts as a gateway to the Cisco bug tracking system that maintains a comprehensive list of defects and vulnerabilities in Cisco products and software. BST provides you with detailed defect information about your products and software.

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