Release Notes for Cisco CRS-1 and Cisco CRS-3 for Cisco IOS XR Software Release 4.1.1

March 15, 2013

Cisco IOS XR Software Release 4.1.1

Text Part Number OL-25405-01

These release notes describe the features provided in the Cisco IOS XR Software Release 4.1.1 for the Cisco CRS Router and are updated as needed.

Note For information on the Cisco CRS Router running Cisco IOS XR Software Release 4.1.1, see the "Important Notes" section on page 42.

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 4.1.1, see the "Caveats" section on page 47. 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:

Introduction

Cisco IOS XRsoftware 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**—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**—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 with out MPLS. This fast convergence innovation is unique to Cisco IOS XR software.

- **Multiprotocol Label Switching (MPLS)**—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—**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)—**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—**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—**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**—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**—Delivers IPv6 traffic over an IPv4/MPLS core with IPv6 provider edge router (6PE) support.

- **IPv6 VPN over MPLS (6VPE) support**—Delivers IPv6 VPN over MPLS (IPv6) VPN traffic over an IPv4 or MPLS core with 6VPE support.

- **Carrier Grade Network Address Translation (CGN)**—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 4.1.1, see the "New Cisco CRS Router Software Features" section on page 30 in this document.

System Requirements

This section describes the system requirements for Cisco IOS XR Software Release 4.1.1 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 24.

Cisco CRS-1 Feature Set Table

Cisco IOS XR software is packaged in *feature sets* (also called *software images*). Each feature set contains a specific set of Cisco IOS XR Software Release 4.1.1 features.

Table 1 lists the Cisco IOS XR software feature set matrix (PIE files) and associated filenames available for the Cisco IOS XR Software Release 4.1.1 supported on the Cisco CRS-1 Series Router.

Table 1   ***Cisco CRS-1 Supported Feature Sets***
              (Cisco IOS XR Software Release 4.1.1 PIE Files)

Feature Set	Filename	Description
Composite Package		
Cisco IOS XR IP Unicast Routing Core Bundle	hfr-mini-p-4.1.1	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-p.vm-4.1.1	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-p.pie-4.1.1	CORBA[2] agent, XML[3] Parser, and HTTP server packages.
Cisco IOS XR MPLS Package	hfr-mpls-p.pie-4.1.1	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-p.pie-4.1.1	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-p.pie-4.1.1	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-p.pie-4.1.1	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-p.pie-4.1.1	Diagnostic utilities for Cisco IOS XR routers.
Cisco IOS XR Documentation Package	hfr-doc-p.pie-4.1.1	.man pages for Cisco IOS XR software on the Cisco CRS chassis.
Cisco IOS XR Carrier Grade NAT Package	hfr-cgn-p.pie-4.1.1	Support for Carrier Grade NAT on Cisco CRS routers.

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-1 Router TAR files.

Table 2   Cisco CRS-1 and Cisco CRS-3 Supported Feature Sets
(Cisco IOS XR Software Release 4.1.1 TAR Files)

Feature Set	Filename	Description
Cisco IOS XR IP/MPLS Core Software	CRS-1-iosxr-4.1.1.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-1-iosxr-k9-4.1.1.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

Cisco CRS-3 Feature Set Table

Table 3 lists the Cisco IOS XR software feature set matrix (PIE files) and associated filenames available for the Cisco IOS XR Software Release 4.1.1 supported on the Cisco CRS-3 Router.

Table 3   *Cisco CRS-3 Supported Feature Sets*
                              (Cisco IOS XR Software Release 4.1.1 PIE Files)

Feature Set	Filename	Description
Composite Package		
Cisco IOS XR IP Unicast Routing Core Bundle	hfr-mini-px-4.1.1	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-4.1.1	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-4.1.1	CORBA[2] agent, XML[3] Parser, and HTTP server packages.
Cisco IOS XR MPLS Package	hfr-mpls-px.pie-4.1.1	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-4.1.1	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-4.1.1	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-4.1.1	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-4.1.1	Diagnostic utilities for Cisco IOS XR routers.
Cisco IOS XR Documentation Package	hfr-doc-px.pie-4.1.1	.man pages for Cisco IOS XR software on the Cisco CRS chassis.
Cisco IOS XR Carrier Grade NAT Package	hfr-cgn-px.pie-4.1.1	Support for Carrier Grade NAT on Cisco CRS routers.

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 4 lists the Cisco CRS-3 Router TAR files.

Table 4   Cisco CRS-3 Supported Feature Sets (Cisco IOS XR Software Release 4.1.1 TAR Files)

Feature Set	Filename	Description
Cisco IOS XR IP/MPLS Core Software	CRS-iosxr-px-4.1.1.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-k9-4.1.1.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 4.1.1 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 USB on MSC-140 and FP-140

- 2-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 7.

Table 5 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 14.

Note With Cisco IOS XR Release 4.1.0 PX, the CRS MSC-140 or CRS FP-140 can now be used for Provider (P) and Provider Edge (PE) Layer 3 router configurations, including Layer 3 VPN features. With Cisco IOS XR Release 4.1.0, CRS MSC-140 or CRS FP-140 now supports Layer 2 VPN functionality. Please contact your Cisco representative for more information.

Table 5 *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 Series 8-Slot Line Card Chassis		

Table 5 **Cisco CRS Supported Hardware and Minimum Software Requirements (continued)**

Component	Part Number	Support from Version
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 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

Table 5   *Cisco CRS Supported Hardware and Minimum Software Requirements (continued)*

Component	Part Number	Support from Version
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 General Chassis Hardware		
Cisco CRS PCM CIA Flash Disk 2 GB	CRS-FLASH-DISK-2G	3.7
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 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
CRS Fabric Cards		
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-3 Series Fabric Card Chassis Switch Fabric Card 140 G	CRS-FCC-SFC-140	4.0.3
Cisco CRS Series 16 Slots Fabric Card / Multi (140G)	CRS-16-FC140/M	4.0.3
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 16-Slot Route Processor	CRS-16-RP	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

Table 5 *Cisco CRS Supported Hardware and Minimum Software Requirements (continued)*

Component	Part Number	Support from Version
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-1 Series Carrier Grade Service Engine PLIM	CRS-CGSE-PLIM	4.1.1
Cisco CRS Label Switch Processor		
Cisco CRS-LSP Label Switch Processor	CRS-LSP	4.1.1
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 2-Port OC-12c/STM-4c Shared Port Adapter	SPA-2XOC12POS	4.0.1
Cisco CRS 4-Port OC-12c/STM-4c Shared Port Adapter	SPA-4XOC12POS	4.0.1
Cisco CRS 8-Port OC-12c/STM-4c Shared Port Adapter	SPA-8XOC12-POS	3.3
Cisco CRS 1-Port OC-48c/STM-16c POS/RPR Shared Port Adapter	SPA-1XOC48-POS/RPR	4.0.1
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 4-port OC-3c/STM1c POS Shared Port Adapter	SPA-4XOC3-POS-V2	4.0.1
Cisco CRS 8-Port OC-3c/STM-lc Shared Port Adapter	SPA-8XOC3-POS	4.0.1
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 Channelized Interface Modules and SPAs		
1-Port Channelized OC12 to DS0 SPA	SPA-1XCHOC12/DS0	4.1.1
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

Table 5 *Cisco CRS Supported Hardware and Minimum Software Requirements (continued)*

Component	Part Number	Support from Version
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 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 20x1GE Flexible Interface Module	20-1GE-FLEX	3.8.1
Cisco CRS-1 Optical to Electrical Modules		
10GBASE-LR XENPAK Module for Cisco CRS	XENPAK-10GB-LR	3.2
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
Cisco 1-port 10GbE SPA WAN/LAN PHY	SPA-1X10GE-WL-V2	3.5.2
Cisco CRS-1 Series 2x10GE WAN/LAN Flexible Interface Module	2-10GE-WL-FLEX	3.8.1
Cisco CRS-1 Series 4-Port Ten Gigabit Ethernet Interface Module	4-10GBE-WL-XFP	3.8.4
Cisco CRS-1 Series 8-Port Ten Gigabit Ethernet Interface Module	8-10GBE-WL-XFP	3.9.1
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

RP-B with CRS-3 is not supported for Multichassis systems; only PRP is supported for such systems. Cisco highly recommends PRP for all CRS-1, CRS-3 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/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** The USB Flash drive is recognized as disk2 on a Performance Route Processor (PRP) during an online insertion and removal (OIR) or when the card is reloaded or reset at the ROMMON prompt. An OIR requires the PRP card to be removed and reinserted during the reset operation.

The CRS FP40 is compatible with the following PLIMs:

- 4-10GE
- 42-1GE
- 20-1GE-FLEX
- 2-10GE-WL-FLEX
- 4-10GBE-WL-XFP
- 8-10GBE-WL-XFP
- 4-10GE-ITU/C

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

CRS CGSE-PLIM Licenses

The following licenses apply to the Cisco CRS-1 Series Carrier Grade Service Engine PLIM in Cisco IOS XR software Release 4.1.1.

Licence	Description
XC-XLAT44-5M	SW license for 5M NAT44 translations
XC-XLAT44-10M	SW license for 10M NAT44 translations
XC-XLAT44-20M	SW license for 20M NAT44 translations
XC-XLAT64-SL	SW license for Stateless NAT64
XC-6RD-BR	SW license for 6rd Border Relay

Software Compatibility

Cisco IOS XR Software Release 4.1.1 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 4.1.1 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 2.03. 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-1 Router* at: http://www.cisco.com/en/US/products/ps5763/products_installation_and_configuration_guides_list.html

- The minimum CPUCNTRL version required for this release is 2.07. For more information about CPU controller bits, refer to the *Cisco IOS XR System Management Configuration Guide for the Cisco CRS-1 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/RP0/CPU0:PE2-A82(admin)#sh fpd package
Thu Jul 28 10:25:02.157 PST


================================ =================================================
                                         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        0.0       0.0
                    FPGA 5.00                    lc   fpga3    5.00        0.0       0.0
                    FPGA 6.04 spb                lc   fpga1    6.04        0.0       0.0
                    ROMMONA swv2.04 spb          lc   rommonA  2.04        2.1       0.0
                    ROMMONB swv2.04 spb          lc   rommon   2.04        2.4       0.0
-----------------------------------------------------------------------------------------
140G-S1S2S3         FPGA 4.01                    lc   fpga2    4.01        0.0       0.0
                    FPGA 6.04 spb                lc   fpga1    6.04        0.0       0.0
                    ROMMONA swv2.04 spb          lc   rommonA  2.04        2.1       0.0
```

```
                       ROMMONB swv2.04 spb      lc   rommon    2.04     2.4     0.0
          --------------------------------------------------------------------------------
Fabric HS123 Superst   FPGA 4.00                lc   fpga2     4.00     0.0     0.0
                       FPGA 6.04 spb            lc   fpga1     6.04     0.0     0.0
                       ROMMONA swv2.04 spb      lc   rommonA   2.04     2.1     0.0
                       ROMMONB swv2.04 spb      lc   rommon    2.04     2.4     0.0
          --------------------------------------------------------------------------------
140G-4-S1S2S3          FPGA 4.01                lc   fpga2     4.01     0.0     0.0
                       FPGA 6.04 spb            lc   fpga1     6.04     0.0     0.0
                       ROMMONA swv2.04 spb      lc   rommonA   2.04     2.1     0.0
                       ROMMONB swv2.04 spb      lc   rommon    2.04     2.4     0.0
          --------------------------------------------------------------------------------
140G-S1S3              FPGA 4.01                lc   fpga2     4.01     0.0     0.0
                       FPGA 6.04 spb            lc   fpga1     6.04     0.0     0.0
                       ROMMONA swv2.04 spb      lc   rommonA   2.04     2.1     0.0
                       ROMMONB swv2.04 spb      lc   rommon    2.04     2.4     0.0
          --------------------------------------------------------------------------------
140G-S1S2S3-2          FPGA 4.01                lc   fpga2     4.01     0.0     0.0
                       FPGA 6.04 spb            lc   fpga1     6.04     0.0     0.0
                       ROMMONA swv2.04 spb      lc   rommonA   2.04     2.1     0.0
                       ROMMONB swv2.04 spb      lc   rommon    2.04     2.4     0.0
          --------------------------------------------------------------------------------
140G-S1S3-2            FPGA 4.01                lc   fpga2     4.01     0.0     0.0
                       FPGA 6.04 spb            lc   fpga1     6.04     0.0     0.0
                       ROMMONA swv2.04 spb      lc   rommonA   2.04     2.2     0.0
                       ROMMONB swv2.04 spb      lc   rommon    2.04     2.4     0.0
          --------------------------------------------------------------------------------
140G-S2-2             FPGA 4.02                lc   fpga2     4.02     0.0     0.0
                       FPGA 16.00               lc   fpga3     16.00    0.0     0.0
                       FPGA 6.04 spb            lc   fpga1     6.04     0.0     0.0
                       ROMMONA swv2.04 spb      lc   rommonA   2.04     2.2     0.0
                       ROMMONB swv2.04 spb      lc   rommon    2.04     2.4     0.0
          --------------------------------------------------------------------------------
1OC768-ITU/C           OPTICS FIRMWARE 110B10   lc   fpga2     110.10   0.0     0.0
          --------------------------------------------------------------------------------
1OC768-DWDM-L          OPTICS FIRMWARE 110B10   lc   fpga2     110.10   0.0     0.0
          --------------------------------------------------------------------------------
1OC768-DPSK/C          OPTICS FIRMWARE 110B14   lc   fpga2     110.14   0.0     0.0
          --------------------------------------------------------------------------------
1OC768-DPSK/C-O        OPTICS FIRMWARE 110B14   lc   fpga2     110.14   0.0     0.0
          --------------------------------------------------------------------------------
1OC768-DPSK/C-E        OPTICS FIRMWARE 110B14   lc   fpga2     110.14   0.0     0.0
          --------------------------------------------------------------------------------
CRS-CGSE-PLIM          FPGA mCPU0 0.559         lc   fpga2     0.559    0.0     0.0
                       FPGA sCPU0 0.559         lc   fpga3     0.559    0.0     0.0
                       FPGA mCPU1 0.559         lc   fpga4     0.559    0.0     0.0
                       FPGA sCPU1 0.559         lc   fpga5     0.559    0.0     0.0
                       FPGA PLIM_SVC 0.41014    lc   fpga1     0.41014  0.0     0.0
          --------------------------------------------------------------------------------
DRP_B                  FPGA 6.04 spb            lc   fpga1     6.04     0.0     0.0
                       ROMMONA swv2.04 asmp     lc   rommonA   2.04     2.1     0.0
                       ROMMONA swv2.04 dsmp     lc   rommonA   2.04     2.1     0.0
                       ROMMONA swv2.04 sp       lc   rommonA   2.04     2.1     0.0
                       ROMMONA swv2.04 spb      lc   rommonA   2.04     2.1     0.0
                       ROMMONB swv2.04 asmp     lc   rommon    2.04     2.4     0.0
                       ROMMONB swv2.04 dsmp     lc   rommon    2.04     2.4     0.0
                       ROMMONB swv2.04 sp       lc   rommon    2.04     2.4     0.0
                       ROMMONB swv2.04 spb      lc   rommon    2.04     2.4     0.0
          --------------------------------------------------------------------------------
MSC_B                  FPGA 6.04 spb            lc   fpga1     6.04     0.0     0.0
                       ROMMONA swv2.04 asmp     lc   rommonA   2.04     2.1     0.0
                       ROMMONA swv2.04 dsmp     lc   rommonA   2.04     2.1     0.0
                       ROMMONA swv2.04 sp       lc   rommonA   2.04     2.1     0.0
                       ROMMONA swv2.04 spb      lc   rommonA   2.04     2.1     0.0
```

```
                        ROMMONB swv2.04 asmp      lc   rommon    2.04    2.4    0.0
                        ROMMONB swv2.04 dsmp      lc   rommon    2.04    2.4    0.0
                        ROMMONB swv2.04 sp        lc   rommon    2.04    2.4    0.0
                        ROMMONB swv2.04 spb       lc   rommon    2.04    2.4    0.0
        -----------------------------------------------------------------------------------
        FP40            FPGA 6.04 spb             lc   fpga1     6.04    0.0    0.0
                        ROMMONA swv2.04 asmp      lc   rommonA   2.04    2.1    0.0
                        ROMMONA swv2.04 dsmp      lc   rommonA   2.04    2.1    0.0
                        ROMMONA swv2.04 sp        lc   rommonA   2.04    2.1    0.0
                        ROMMONA swv2.04 spb       lc   rommonA   2.04    2.1    0.0
                        ROMMONB swv2.04 asmp      lc   rommon    2.04    2.4    0.0
                        ROMMONB swv2.04 dsmp      lc   rommon    2.04    2.4    0.0
                        ROMMONB swv2.04 sp        lc   rommon    2.04    2.4    0.0
                        ROMMONB swv2.04 spb       lc   rommon    2.04    2.4    0.0
        -----------------------------------------------------------------------------------
        CRS1-SIP-800    JACKET FPGA swv6.0        lc   fpga1     6.00    5.0    0.0
                        FPGA swv6.0 hwv80         lc   fpga1     6.00    5.0    0.80
        -----------------------------------------------------------------------------------
        8-10GBE         FPGA swvA.0               lc   fpga1    10.00    0.0    0.0
        -----------------------------------------------------------------------------------
        OC48-POS-16-ED  FPGA PLIM_OC48 9.0        lc   fpga1     9.00    0.0    0.0
        -----------------------------------------------------------------------------------
        4-10GBE         FPGA sw_4p_v15.0          lc   fpga1    15.00    0.0    0.0
        -----------------------------------------------------------------------------------
        8-10GBE         FPGA sw_8p_v15.0          lc   fpga1    15.00    0.0    0.0
        -----------------------------------------------------------------------------------
        4-10GE          SQUIRREL FPGA 10.0        lc   fpga1    10.00    0.0    0.0
        -----------------------------------------------------------------------------------
        42-1GE          FPGA swv6.0               lc   fpga1     6.00    0.0    0.0
                        FPGA swv6.0 hwv0.80       lc   fpga1     6.00    0.0    0.80
        -----------------------------------------------------------------------------------
        20-1GE-FLEX     FPGA swv6.0               lc   fpga1     6.00    0.0    0.0
                        FPGA swv6.0 hwv0.80       lc   fpga1     6.00    0.0    0.80
        -----------------------------------------------------------------------------------
        2-10GE-WL-FLEX  FPGA swv6.0               lc   fpga1     6.00    0.0    0.0
                        FPGA swv6.0 hwv0.80       lc   fpga1     6.00    0.0    0.80
        -----------------------------------------------------------------------------------
        CRS-16-ALARM-C  FPGA 6.04 spb             lc   fpga1     6.04    0.0    0.0
                        ROMMONA swv2.04 sp        lc   rommonA   2.04    2.1    0.0
                        ROMMONA swv2.04 spb       lc   rommonA   2.04    2.1    0.0
                        ROMMONB swv2.04 sp        lc   rommon    2.04    2.4    0.0
                        ROMMONB swv2.04 spb       lc   rommon    2.04    2.4    0.0
        -----------------------------------------------------------------------------------
        CRS-16-ALARM-B  FPGA 6.04 spb             lc   fpga1     6.04    0.0    0.0
                        ROMMONA swv2.04 spb       lc   rommonA   2.04    2.2    0.0
                        ROMMONB swv2.03 spb       lc   rommon    2.04    2.4    0.0
        -----------------------------------------------------------------------------------
        CRS-16-FAN-CT   FPGA 6.04 spb             lc   fpga1     6.04    0.0    0.0
                        ROMMONA swv2.04 spb       lc   rommonA   2.04    2.2    0.0
                        ROMMONB swv2.04 spb       lc   rommon    2.04    2.4    0.0
        -----------------------------------------------------------------------------------
        CRS-16-LCC-F-CT-B FPGA 6.04 spb           lc   fpga1     6.04    0.0    0.0
                        ROMMONA swv2.04 spb       lc   rommonA   2.04    2.1    0.0
                        ROMMONB swv2.04 spb       lc   rommon    2.04    2.4    0.0
        -----------------------------------------------------------------------------------
        CRS-FCC-LED     FPGA 6.04 spb             lc   fpga1     6.04    0.0    0.0
                        ROMMONA swv2.04 sp        lc   rommonA   2.04    2.1    0.0
                        ROMMONA swv2.04 spb       lc   rommonA   2.04    2.1    0.0
                        ROMMONB swv2.04 sp        lc   rommon    2.04    2.4    0.0
                        ROMMONB swv2.04 spb       lc   rommon    2.04    2.4    0.0
        -----------------------------------------------------------------------------------
        Route Processor ROMMONA swv2.04 asmp      lc   rommonA   2.04    2.1    0.0
                        ROMMONA swv2.04 dsmp      lc   rommonA   2.04    2.1    0.0
                        ROMMONB swv2.04 asmp      lc   rommon    2.04    2.4    0.0
```

```
                        ROMMONB swv2.04 dsmp     lc    rommon    2.04    2.4    0.0
---------------------------------------------------------------------------------------
SC                      ROMMONA swv2.04 asmp     lc    rommonA   2.04    2.1    0.0
                        ROMMONA swv2.04 dsmp     lc    rommonA   2.04    2.1    0.0
                        ROMMONB swv2.04 asmp     lc    rommon    2.04    2.4    0.0
                        ROMMONB swv2.04 dsmp     lc    rommon    2.04    2.4    0.0
---------------------------------------------------------------------------------------
RP                      ROMMONA swv2.04 asmp     lc    rommonA   2.04    2.1    0.0
                        ROMMONA swv2.04 dsmp     lc    rommonA   2.04    2.1    0.0
                        ROMMONB swv2.04 asmp     lc    rommon    2.04    2.4    0.0
                        ROMMONB swv2.04 dsmp     lc    rommon    2.04    2.4    0.0
---------------------------------------------------------------------------------------
Shelf Controller GE   ROMMONA swv2.04 asmp     lc    rommonA   2.04    2.1    0.0
                        ROMMONA swv2.04 dsmp     lc    rommonA   2.04    2.1    0.0
                        ROMMONB swv2.04 asmp     lc    rommon    2.04    2.4    0.0
                        ROMMONB swv2.04 dsmp     lc    rommon    2.04    2.4    0.0
---------------------------------------------------------------------------------------
RP                      ROMMONA swv2.04 asmp     lc    rommonA   2.04    2.1    0.0
                        ROMMONA swv2.04 dsmp     lc    rommonA   2.04    2.1    0.0
                        ROMMONB swv2.04 asmp     lc    rommon    2.04    2.4    0.0
                        ROMMONB swv2.04 dsmp     lc    rommon    2.04    2.4    0.0
---------------------------------------------------------------------------------------
Shelf Controller GE2 ROMMONA swv2.04 asmp     lc    rommonA   2.04    2.1    0.0
                        ROMMONA swv2.04 dsmp     lc    rommonA   2.04    2.1    0.0
                        ROMMONB swv2.04 asmp     lc    rommon    2.04    2.4    0.0
                        ROMMONB swv2.04 dsmp     lc    rommon    2.04    2.4    0.0
---------------------------------------------------------------------------------------
DRP                     ROMMONA swv2.04 asmp     lc    rommonA   2.04    2.1    0.0
                        ROMMONA swv2.04 dsmp     lc    rommonA   2.04    2.1    0.0
                        ROMMONA swv2.04 sp       lc    rommonA   2.04    2.1    0.0
                        ROMMONB swv2.04 asmp     lc    rommon    2.04    2.4    0.0
                        ROMMONB swv2.04 dsmp     lc    rommon    2.04    2.4    0.0
                        ROMMONB swv2.04 sp       lc    rommon    2.04    2.4    0.0
---------------------------------------------------------------------------------------
S1S2S3                  ROMMONA swv2.04 sp       lc    rommonA   2.04    2.1    0.0
                        ROMMONB swv2.04 sp       lc    rommon    2.04    2.4    0.0
---------------------------------------------------------------------------------------
S1S3                    ROMMONA swv2.04 sp       lc    rommonA   2.04    2.1    0.0
                        ROMMONB swv2.04 sp       lc    rommon    2.04    2.4    0.0
---------------------------------------------------------------------------------------
S2                      ROMMONA swv2.04 sp       lc    rommonA   2.04    2.1    0.0
                        ROMMONB swv2.04 sp       lc    rommon    2.04    2.4    0.0
---------------------------------------------------------------------------------------
Fabric HS123            ROMMONA swv2.04 sp       lc    rommonA   2.04    2.1    0.0
                        ROMMONB swv2.04 sp       lc    rommon    2.04    2.4    0.0
---------------------------------------------------------------------------------------
Fabric QQS123           ROMMONA swv2.04 sp       lc    rommonA   2.04    2.1    0.0
                        ROMMONB swv2.04 sp       lc    rommon    2.04    2.4    0.0
---------------------------------------------------------------------------------------
LED                     ROMMONA swv2.04 sp       lc    rommonA   2.04    2.1    0.0
                        ROMMONB swv2.04 sp       lc    rommon    2.04    2.4    0.0
---------------------------------------------------------------------------------------
40G-MSC                 ROMMONA swv2.04 asmp     lc    rommonA   2.04    2.1    0.0
                        ROMMONA swv2.04 dsmp     lc    rommonA   2.04    2.1    0.0
                        ROMMONA swv2.04 sp       lc    rommonA   2.04    2.1    0.0
                        ROMMONB swv2.04 asmp     lc    rommon    2.04    2.4    0.0
                        ROMMONB swv2.04 dsmp     lc    rommon    2.04    2.4    0.0
                        ROMMONB swv2.04 sp       lc    rommon    2.04    2.4    0.0
---------------------------------------------------------------------------------------
CRS-16-ALARM            ROMMONA swv2.04 sp       lc    rommonA   2.04    2.1    0.0
                        ROMMONB swv2.04 sp       lc    rommon    2.04    2.4    0.0
---------------------------------------------------------------------------------------
CRS-16-LCC-FAN-CT       ROMMONA swv2.04 sp       lc    rommonA   2.04    2.1    0.0
                        ROMMONB swv2.04 sp       lc    rommon    2.04    2.4    0.0
```

```
-------------------------------------------------------------------------------
FC Fan Controller    ROMMONA swv2.04 sp     lc   rommonA   2.04    2.1     0.0
                     ROMMONB swv2.04 sp     lc   rommon    2.04    2.4     0.0
-------------------------------------------------------------------------------
SPA-4XT3/E3          SPA E3 Subrate FPGA    spa  fpga2     1.04    0.0     0.0
                     SPA T3 Subrate FPGA    spa  fpga3     1.04    0.0     0.0
                     SPA I/O FPGA           spa  fpga1     1.00    0.0     0.0
                     SPA ROMMON             spa  rommon    2.12    0.0     0.0
-------------------------------------------------------------------------------
SPA-2XT3/E3          SPA E3 Subrate FPGA    spa  fpga2     1.04    0.0     0.0
                     SPA T3 Subrate FPGA    spa  fpga3     1.04    0.0     0.0
                     SPA I/O FPGA           spa  fpga1     1.00    0.0     0.0
                     SPA ROMMON             spa  rommon    2.12    0.0     0.0
-------------------------------------------------------------------------------
SPA-1XCHOC48/DS3     SPA I/O FPGA           spa  fpga2     1.00    0.0     0.49
                     SPA I/O FPGA           spa  fpga3     1.00    0.0     0.52
                     SPA I/O FPGA           spa  fpga1     1.36    0.0     0.49
                     SPA ROMMON             spa  rommon    2.02    0.0     0.49
-------------------------------------------------------------------------------
SPA-1XCHOC12/DS0     SPA I/O FPGA           spa  fpga2     1.00    0.0     0.49
                     SPA I/O FPGA           spa  fpga1     1.36    0.0     0.49
                     SPA ROMMON             spa  rommon    2.02    0.0     .49
-------------------------------------------------------------------------------
SPA-OC192POS         SPA FPGA swv1.3        spa  fpga1     1.03    0.0     0.0
-------------------------------------------------------------------------------
SPA-8XOC12-POS       SPA FPGA swv1.0        spa  fpga1     1.00    0.0     0.5
-------------------------------------------------------------------------------
SPA-4XOC3-POS        SPA FPGA swv3.4        spa  fpga1     3.04    0.0     0.0
-------------------------------------------------------------------------------
SPA-OC192POS-XFP     SPA FPGA swv1.2        spa  fpga1     1.02    0.0     0.0
-------------------------------------------------------------------------------
SPA-8X1GE            SPA FPGA swv1.8        spa  fpga1     1.08    0.0     0.0
-------------------------------------------------------------------------------
SPA-2XOC48POS/RPR    SPA FPGA swv1.0        spa  fpga1     1.00    0.0     0.0
-------------------------------------------------------------------------------
SPA-4XOC48POS/RPR    SPA FPGA swv1.0        spa  fpga1     1.00    0.0     0.0
-------------------------------------------------------------------------------
SPA-1XOC48POS/RPR    SPA FPGA swv1.2        spa  fpga1     1.02    0.0     0.0
-------------------------------------------------------------------------------
SPA-8XOC3-POS        SPA FPGA swv1.0        spa  fpga1     1.00    0.0     0.5
                     SPA FPGA swv1.0        spa  fpga1     1.00    0.0     0.5
-------------------------------------------------------------------------------
SPA-2XOC12-POS       SPA FPGA swv1.0        spa  fpga1     1.00    0.0     0.5
-------------------------------------------------------------------------------
SPA-4XOC12-POS       SPA FPGA swv1.0        spa  fpga1     1.00    0.0     0.5
-------------------------------------------------------------------------------
SPA-10X1GE-V2        SPA FPGA swv1.10       spa  fpga1     1.10    0.0     0.0
-------------------------------------------------------------------------------
SPA-8X1GE-V2         SPA FPGA swv1.10       spa  fpga1     1.10    0.0     0.0
-------------------------------------------------------------------------------
SPA-5X1GE-V2         SPA FPGA swv1.10       spa  fpga1     1.10    0.0     0.0
-------------------------------------------------------------------------------
SPA-1X10GE-L-V2      SPA FPGA swv1.11       spa  fpga1     1.11    0.0     0.0
-------------------------------------------------------------------------------
SPA-4XOC3-POS-V2     SPA FPGA swv1.0        spa  fpga1     1.00    0.0     0.5
-------------------------------------------------------------------------------
SPA-1X10GE-WL-V2     SPA FPGA swv1.11       spa  fpga1     1.11    0.0     0.0
-------------------------------------------------------------------------------
SPA-1XOC3-ATM-V2     SPA FPGA swv1.2        spa  fpga1     2.02    0.0     0.0
-------------------------------------------------------------------------------
SPA-2XOC3-ATM-V2     SPA FPGA swv1.2        spa  fpga1     2.02    0.0     0.0
-------------------------------------------------------------------------------
SPA-3XOC3-ATM-V2     SPA FPGA swv1.2        spa  fpga1     2.02    0.0     0.0
-------------------------------------------------------------------------------
```

```
SPA-1XOC12-ATM-V2    SPA FPGA swv1.2          spa  fpga1     2.02      0.0       0.0
-----------------------------------------------------------------------------------
RP/0/RP0/CPU0:PE2-A82(admin)#
```

Cisco CRS-3 show fpd package Output

```
RP/0/RP0/CPU0:a4(admin)#sh fpd pack
 =============================== =================================================
                                        Field Programmable Device Package
                                 =================================================
                                                  SW        Min Req   Min Req
Card Type                FPD Description      Type Subtype   Version   SW Ver    HW Vers
==================== ========================= ==== ======= ========== ======== =======
PRP                  FPGA ZJF uBlaze           lc   fpga2    0.01      0.0       0.0
                     S-8 FPGA Nirvana          lc   fpga3    13.00     0.0       0.0
                     FPGA BCM 8727             lc   fpga4    0.01      0.0       0.0
                     FPGA MCU                  lc   fpga5    0.01      0.0       0.0
                     S-8 FPGA UTI              lc   fpga6    4.09      0.0       0.0
                     FPGA CPU ZJF              lc   fpga1    7.00      0.0       0.0
                     ROMMONA swv2.04 x86mp     lc   rommonA  2.04      2.3       0.0
                     ROMMONB swv2.04 x86mp     lc   rommon   2.04      2.4       0.0
--------------------------------------------------------------------------------------
PRP                  FPGA ZJF uBlaze           lc   fpga2    0.01      0.0       0.0
                     S-16 FPGA Nirvana         lc   fpga3    13.00     0.0       0.0
                     FPGA BCM 8727             lc   fpga4    0.01      0.0       0.0
                     FPGA MCU                  lc   fpga5    0.01      0.0       0.0
                     ZJF FPGA CPU              lc   fpga1    7.00      0.0       0.0
                     ROMMONA swv2.04 x86mp     lc   rommonA  2.04      2.3       0.0
                     ROMMONB swv2.04 x86mp     lc   rommon   2.04      2.4       0.0
--------------------------------------------------------------------------------------
S2                   FPGA 4.02                 lc   fpga2    4.02      0.0       0.0
                     FPGA 5.00                 lc   fpga3    5.00      0.0       0.0
                     FPGA 6.04 spb             lc   fpga1    6.04      0.0       0.0
                     ROMMONA swv2.04 spb       lc   rommonA  2.04      2.1       0.0
                     ROMMONB swv2.04 spb       lc   rommon   2.04      2.4       0.0
--------------------------------------------------------------------------------------
140G-S1S2S3          FPGA 4.01                 lc   fpga2    4.01      0.0       0.0
                     FPGA 6.04 spb             lc   fpga1    6.04      0.0       0.0
                     ROMMONA swv2.04 spb       lc   rommonA  2.04      2.1       0.0
                     ROMMONB swv2.04 spb       lc   rommon   2.04      2.4       0.0
--------------------------------------------------------------------------------------
Fabric HS123 Superst FPGA 4.00                 lc   fpga2    4.00      0.0       0.0
                     FPGA 6.04 spb             lc   fpga1    6.04      0.0       0.0
                     ROMMONA swv2.04 spb       lc   rommonA  2.04      2.1       0.0
                     ROMMONB swv2.04 spb       lc   rommon   2.04      2.4       0.0
--------------------------------------------------------------------------------------
140G-4-S1S2S3        FPGA 4.01                 lc   fpga2    4.01      0.0       0.0
                     FPGA 6.04 spb             lc   fpga1    6.04      0.0       0.0
                     ROMMONA swv2.04 spb       lc   rommonA  2.04      2.1       0.0
                     ROMMONB swv2.04 spb       lc   rommon   2.04      2.4       0.0
--------------------------------------------------------------------------------------
140G-S1S3            FPGA 4.01                 lc   fpga2    4.01      0.0       0.0
                     FPGA 6.04 spb             lc   fpga1    6.04      0.0       0.0
                     ROMMONA swv2.04 spb       lc   rommonA  2.04      2.1       0.0
                     ROMMONB swv2.04 spb       lc   rommon   2.04      2.4       0.0
--------------------------------------------------------------------------------------
140G-S1S2S3-2        FPGA 4.01                 lc   fpga2    4.01      0.0       0.0
                     FPGA 6.04 spb             lc   fpga1    6.04      0.0       0.0
                     ROMMONA swv2.04 spb       lc   rommonA  2.04      2.1       0.0
                     ROMMONB swv2.04 spb       lc   rommon   2.04      2.4       0.0
--------------------------------------------------------------------------------------
140G-S1S3-2          FPGA 4.01                 lc   fpga2    4.01      0.0       0.0
                     FPGA 6.04 spb             lc   fpga1    6.04      0.0       0.0
```

```
                        ROMMONA swv2.04 spb        lc   rommonA    2.04     2.2     0.0
                        ROMMONB swv2.04 spb        lc   rommon     2.04     2.4     0.0
        ----------------------------------------------------------------------------------
        140G-S2-2       FPGA 4.02                  lc   fpga2      4.02     0.0     0.0
                        FPGA 16.00                 lc   fpga3     16.00     0.0     0.0
                        FPGA 6.04 spb              lc   fpga1      6.04     0.0     0.0
                        ROMMONA swv2.04 spb        lc   rommonA    2.04     2.2     0.0
                        ROMMONB swv2.04 spb        lc   rommon     2.04     2.4     0.0
        ----------------------------------------------------------------------------------
        140G-MSC        FPGA Linecard 0.36         lc   fpga2      0.36     0.0     0.0
                        FPGA CPU 0.8               lc   fpga1      0.08     0.0     0.0
                        ROMMONA swv2.04 kensho     lc   rommonA    2.04     2.4     0.0
                        ROMMONB swv2.04 kensho     lc   rommon     2.04     2.4     0.0
        ----------------------------------------------------------------------------------
        FP-140G         FPGA Linecard 0.36         lc   fpga2      0.36     0.0     0.0
                        FPGA CPU 0.8               lc   fpga1      0.08     0.0     0.0
                        ROMMONA swv2.04 kensho     lc   rommonA    2.04     2.4     0.0
                        ROMMONB swv2.04 kensho     lc   rommon     2.04     2.4     0.0
        ----------------------------------------------------------------------------------
        CRS-LSP         FPGA Linecard 0.36         lc   fpga2      0.36     0.0     0.0
                        FPGA CPU 0.8               lc   fpga1      0.08     0.0     0.0
                        ROMMONA swv2.04 kensho     lc   rommonA    2.04     2.4     0.0
                        ROMMONB swv2.04 kensho     lc   rommon     2.04     2.4     0.0
        ----------------------------------------------------------------------------------
        1OC768-ITU/C    OPTICS FIRMWARE 110B10     lc   fpga2    110.10     0.0     0.0
        ----------------------------------------------------------------------------------
        1OC768-DWDM-L   OPTICS FIRMWARE 110B10     lc   fpga2    110.10     0.0     0.0
        ----------------------------------------------------------------------------------
        1OC768-DPSK/C   OPTICS FIRMWARE 110B14     lc   fpga2    110.14     0.0     0.0
        ----------------------------------------------------------------------------------
        1OC768-DPSK/C-O OPTICS FIRMWARE 110B14     lc   fpga2    110.14     0.0     0.0
        ----------------------------------------------------------------------------------
        1OC768-DPSK/C-E OPTICS FIRMWARE 110B14     lc   fpga2    110.14     0.0     0.0
        ----------------------------------------------------------------------------------
        CRS-CGSE-PLIM   FPGA mCPU0 0.559           lc   fpga2      0.559    0.0     0.0
                        FPGA sCPU0 0.559           lc   fpga3      0.559    0.0     0.0
                        FPGA mCPU1 0.559           lc   fpga4      0.559    0.0     0.0
                        FPGA sCPU1 0.559           lc   fpga5      0.559    0.0     0.0
                        FPGA PLIM_SVC 0.41014      lc   fpga1      0.41014  0.0     0.0
        ----------------------------------------------------------------------------------
        20-10GBE        PLIM FPGA 42.0             lc   fpga3     42.00     0.0     0.0
        ----------------------------------------------------------------------------------
        12-10GBE        PLIM FPGA 42.0             lc   fpga3     42.00     0.0     0.0
        ----------------------------------------------------------------------------------
        1-100GBE        PLIM FPGA 19.0             lc   fpga3     19.00     0.0     0.0
                        RX MAC FPGA 49.0           lc   fpga4     49.00     0.0     0.0
                        TX MAC FPGA 34.0           lc   fpga5     34.00     0.0     0.0
        ----------------------------------------------------------------------------------
        14-10GBE        PLIM FPGA 42.0             lc   fpga3     42.00     0.0     0.0
        ----------------------------------------------------------------------------------
        DRP_B           FPGA 6.04 spb              lc   fpga1      6.04     0.0     0.0
                        ROMMONA swv2.04 asmp       lc   rommonA    2.04     2.1     0.0
                        ROMMONA swv2.04 dsmp       lc   rommonA    2.04     2.1     0.0
                        ROMMONA swv2.04 sp         lc   rommonA    2.04     2.1     0.0
                        ROMMONA swv2.04 spb        lc   rommonA    2.04     2.1     0.0
                        ROMMONB swv2.04 asmp       lc   rommon     2.04     2.4     0.0
                        ROMMONB swv2.04 dsmp       lc   rommon     2.04     2.4     0.0
                        ROMMONB swv2.04 sp         lc   rommon     2.04     2.4     0.0
                        ROMMONB swv2.04 spb        lc   rommon     2.04     2.4     0.0
        ----------------------------------------------------------------------------------
        MSC_B           FPGA 6.04 spb              lc   fpga1      6.04     0.0     0.0
                        ROMMONA swv2.04 asmp       lc   rommonA    2.04     2.1     0.0
                        ROMMONA swv2.04 dsmp       lc   rommonA    2.04     2.1     0.0
                        ROMMONA swv2.04 sp         lc   rommonA    2.04     2.1     0.0
```

```
                        ROMMONA swv2.04 spb      lc   rommonA    2.04      2.1      0.0
                        ROMMONB swv2.04 asmp     lc   rommon     2.04      2.4      0.0
                        ROMMONB swv2.04 dsmp     lc   rommon     2.04      2.4      0.0
                        ROMMONB swv2.04 sp       lc   rommon     2.04      2.4      0.0
                        ROMMONB swv2.04 spb      lc   rommon     2.04      2.4      0.0
------------------------------------------------------------------------------------------
FP40                    FPGA 6.04 spb            lc   fpga1      6.04      0.0      0.0
                        ROMMONA swv2.04 asmp     lc   rommonA    2.04      2.1      0.0
                        ROMMONA swv2.04 dsmp     lc   rommonA    2.04      2.1      0.0
                        ROMMONA swv2.04 sp       lc   rommonA    2.04      2.1      0.0
                        ROMMONA swv2.04 spb      lc   rommonA    2.04      2.1      0.0
                        ROMMONB swv2.04 asmp     lc   rommon     2.04      2.4      0.0
                        ROMMONB swv2.04 dsmp     lc   rommon     2.04      2.4      0.0
                        ROMMONB swv2.04 sp       lc   rommon     2.04      2.4      0.0
                        ROMMONB swv2.04 spb      lc   rommon     2.04      2.4      0.0
------------------------------------------------------------------------------------------
CRS1-SIP-800            JACKET FPGA swv6.0       lc   fpga1      6.00      5.0      0.0
                        FPGA swv6.0 hwv80        lc   fpga1      6.00      5.0      0.80
------------------------------------------------------------------------------------------
8-10GBE                 FPGA swvA.0              lc   fpga1     10.00      0.0      0.0
------------------------------------------------------------------------------------------
OC48-POS-16-ED          FPGA PLIM_OC48 9.0       lc   fpga1      9.00      0.0      0.0
------------------------------------------------------------------------------------------
4-10GBE                 FPGA sw_4p_v15.0         lc   fpga1     15.00      0.0      0.0
------------------------------------------------------------------------------------------
8-10GBE                 FPGA sw_8p_v15.0         lc   fpga1     15.00      0.0      0.0
------------------------------------------------------------------------------------------
4-10GE                  SQUIRREL FPGA 10.0       lc   fpga1     10.00      0.0      0.0
------------------------------------------------------------------------------------------
42-1GE                  FPGA swv6.0              lc   fpga1      6.00      0.0      0.0
                        FPGA swv6.0 hwv0.80      lc   fpga1      6.00      0.0      0.80
------------------------------------------------------------------------------------------
20-1GE-FLEX             FPGA swv6.0              lc   fpga1      6.00      0.0      0.0
                        FPGA swv6.0 hwv0.80      lc   fpga1      6.00      0.0      0.80
------------------------------------------------------------------------------------------
2-10GE-WL-FLEX          FPGA swv6.0              lc   fpga1      6.00      0.0      0.0
                        FPGA swv6.0 hwv0.80      lc   fpga1      6.00      0.0      0.80
------------------------------------------------------------------------------------------
CRS-16-ALARM-C          FPGA 6.04 spb            lc   fpga1      6.04      0.0      0.0
                        ROMMONA swv2.04 sp       lc   rommonA    2.04      2.1      0.0
                        ROMMONA swv2.04 spb      lc   rommonA    2.04      2.1      0.0
                        ROMMONB swv2.04 sp       lc   rommon     2.04      2.4      0.0
                        ROMMONB swv2.04 spb      lc   rommon     2.04      2.4      0.0
------------------------------------------------------------------------------------------
CRS-16-ALARM-B          FPGA 6.04 spb            lc   fpga1      6.04      0.0      0.0
                        ROMMONA swv2.04 spb      lc   rommonA    2.04      2.2      0.0
                        ROMMONB swv2.03 spb      lc   rommon     2.04      2.4      0.0
------------------------------------------------------------------------------------------
CRS-16-FAN-CT           FPGA 6.04 spb            lc   fpga1      6.04      0.0      0.0
                        ROMMONA swv2.04 spb      lc   rommonA    2.04      2.2      0.0
                        ROMMONB swv2.04 spb      lc   rommon     2.04      2.4      0.0
------------------------------------------------------------------------------------------
CRS-16-LCC-F-CT-B       FPGA 6.04 spb            lc   fpga1      6.04      0.0      0.0
                        ROMMONA swv2.04 spb      lc   rommonA    2.04      2.1      0.0
                        ROMMONB swv2.04 spb      lc   rommon     2.04      2.4      0.0
------------------------------------------------------------------------------------------
CRS-FCC-LED             FPGA 6.04 spb            lc   fpga1      6.04      0.0      0.0
                        ROMMONA swv2.04 sp       lc   rommonA    2.04      2.1      0.0
                        ROMMONA swv2.04 spb      lc   rommonA    2.04      2.1      0.0
                        ROMMONB swv2.04 sp       lc   rommon     2.04      2.4      0.0
                        ROMMONB swv2.04 spb      lc   rommon     2.04      2.4      0.0
------------------------------------------------------------------------------------------
Route Processor         ROMMONA swv2.04 asmp     lc   rommonA    2.04      2.1      0.0
                        ROMMONA swv2.04 dsmp     lc   rommonA    2.04      2.1      0.0
```

```
                       ROMMONB swv2.04 asmp      lc   rommon    2.04       2.4       0.0
                       ROMMONB swv2.04 dsmp      lc   rommon    2.04       2.4       0.0
-----------------------------------------------------------------------------------------------
SC                     ROMMONA swv2.04 asmp      lc   rommonA   2.04       2.1       0.0
                       ROMMONA swv2.04 dsmp      lc   rommonA   2.04       2.1       0.0
                       ROMMONB swv2.04 asmp      lc   rommon    2.04       2.4       0.0
                       ROMMONB swv2.04 dsmp      lc   rommon    2.04       2.4       0.0
-----------------------------------------------------------------------------------------------
RP                     ROMMONA swv2.04 asmp      lc   rommonA   2.04       2.1       0.0
                       ROMMONA swv2.04 dsmp      lc   rommonA   2.04       2.1       0.0
                       ROMMONB swv2.04 asmp      lc   rommon    2.04       2.4       0.0
                       ROMMONB swv2.04 dsmp      lc   rommon    2.04       2.4       0.0
-----------------------------------------------------------------------------------------------
Shelf Controller GE    ROMMONA swv2.04 asmp      lc   rommonA   2.04       2.1       0.0
                       ROMMONA swv2.04 dsmp      lc   rommonA   2.04       2.1       0.0
                       ROMMONB swv2.04 asmp      lc   rommon    2.04       2.4       0.0
                       ROMMONB swv2.04 dsmp      lc   rommon    2.04       2.4       0.0
-----------------------------------------------------------------------------------------------
RP                     ROMMONA swv2.04 asmp      lc   rommonA   2.04       2.1       0.0
                       ROMMONA swv2.04 dsmp      lc   rommonA   2.04       2.1       0.0
                       ROMMONB swv2.04 asmp      lc   rommon    2.04       2.4       0.0
                       ROMMONB swv2.04 dsmp      lc   rommon    2.04       2.4       0.0
-----------------------------------------------------------------------------------------------
Shelf Controller GE2 ROMMONA swv2.04 asmp        lc   rommonA   2.04       2.1       0.0
                       ROMMONA swv2.04 dsmp      lc   rommonA   2.04       2.1       0.0
                       ROMMONB swv2.04 asmp      lc   rommon    2.04       2.4       0.0
                       ROMMONB swv2.04 dsmp      lc   rommon    2.04       2.4       0.0
-----------------------------------------------------------------------------------------------
DRP                    ROMMONA swv2.04 asmp      lc   rommonA   2.04       2.1       0.0
                       ROMMONA swv2.04 dsmp      lc   rommonA   2.04       2.1       0.0
                       ROMMONA swv2.04 sp        lc   rommonA   2.04       2.1       0.0
                       ROMMONB swv2.04 asmp      lc   rommon    2.04       2.4       0.0
                       ROMMONB swv2.04 dsmp      lc   rommon    2.04       2.4       0.0
                       ROMMONB swv2.04 sp        lc   rommon    2.04       2.4       0.0
-----------------------------------------------------------------------------------------------
S1S2S3                 ROMMONA swv2.04 sp        lc   rommonA   2.04       2.1       0.0
                       ROMMONB swv2.04 sp        lc   rommon    2.04       2.4       0.0
-----------------------------------------------------------------------------------------------
S1S3                   ROMMONA swv2.04 sp        lc   rommonA   2.04       2.1       0.0
                       ROMMONB swv2.04 sp        lc   rommon    2.04       2.4       0.0
-----------------------------------------------------------------------------------------------
S2                     ROMMONA swv2.04 sp        lc   rommonA   2.04       2.1       0.0
                       ROMMONB swv2.04 sp        lc   rommon    2.04       2.4       0.0
-----------------------------------------------------------------------------------------------
Fabric HS123           ROMMONA swv2.04 sp        lc   rommonA   2.04       2.1       0.0
                       ROMMONB swv2.04 sp        lc   rommon    2.04       2.4       0.0
-----------------------------------------------------------------------------------------------
Fabric QQS123          ROMMONA swv2.04 sp        lc   rommonA   2.04       2.1       0.0
                       ROMMONB swv2.04 sp        lc   rommon    2.04       2.4       0.0
-----------------------------------------------------------------------------------------------
LED                    ROMMONA swv2.04 sp        lc   rommonA   2.04       2.1       0.0
                       ROMMONB swv2.04 sp        lc   rommon    2.04       2.4       0.0
-----------------------------------------------------------------------------------------------
40G-MSC                ROMMONA swv2.04 asmp      lc   rommonA   2.04       2.1       0.0
                       ROMMONA swv2.04 dsmp      lc   rommonA   2.04       2.1       0.0
                       ROMMONA swv2.04 sp        lc   rommonA   2.04       2.1       0.0
                       ROMMONB swv2.04 asmp      lc   rommon    2.04       2.4       0.0
                       ROMMONB swv2.04 dsmp      lc   rommon    2.04       2.4       0.0
                       ROMMONB swv2.04 sp        lc   rommon    2.04       2.4       0.0
-----------------------------------------------------------------------------------------------
CRS-16-ALARM           ROMMONA swv2.04 sp        lc   rommonA   2.04       2.1       0.0
                       ROMMONB swv2.04 sp        lc   rommon    2.04       2.4       0.0
-----------------------------------------------------------------------------------------------
CRS-16-LCC-FAN-CT      ROMMONA swv2.04 sp        lc   rommonA   2.04       2.1       0.0
```

```
                        ROMMONB swv2.04 sp      lc   rommon     2.04      2.4       0.0
-------------------------------------------------------------------------------------------
FC Fan Controller    ROMMONA swv2.04 sp      lc   rommonA    2.04      2.1       0.0
                        ROMMONB swv2.04 sp      lc   rommon     2.04      2.4       0.0
-------------------------------------------------------------------------------------------
SPA-4XT3/E3           SPA E3 Subrate FPGA     spa  fpga2      1.04      0.0       0.0
                        SPA T3 Subrate FPGA     spa  fpga3      1.04      0.0       0.0
                        SPA I/O FPGA            spa  fpga1      1.00      0.0       0.0
                        SPA ROMMON              spa  rommon     2.12      0.0       0.0
-------------------------------------------------------------------------------------------
SPA-2XT3/E3           SPA E3 Subrate FPGA     spa  fpga2      1.04      0.0       0.0
                        SPA T3 Subrate FPGA     spa  fpga3      1.04      0.0       0.0
                        SPA I/O FPGA            spa  fpga1      1.00      0.0       0.0
                        SPA ROMMON              spa  rommon     2.12      0.0       0.0
-------------------------------------------------------------------------------------------
SPA-1XCHOC48/DS3      SPA I/O FPGA            spa  fpga2      1.00      0.0       0.49
                        SPA I/O FPGA            spa  fpga3      1.00      0.0       0.52
                        SPA I/O FPGA            spa  fpga1      1.36      0.0       0.49
                        SPA ROMMON              spa  rommon     2.02      0.0       0.49
-------------------------------------------------------------------------------------------
SPA-1XCHOC12/DS0      SPA I/O FPGA            spa  fpga2      1.00      0.0       0.49
                        SPA I/O FPGA            spa  fpga1      1.36      0.0       0.49
                        SPA ROMMON              spa  rommon     2.02      0.0       0.49
-------------------------------------------------------------------------------------------
SPA-OC192POS         SPA FPGA swv1.3         spa  fpga1      1.03      0.0       0.0
-------------------------------------------------------------------------------------------
SPA-8XOC12-POS       SPA FPGA swv1.0         spa  fpga1      1.00      0.0       0.5
-------------------------------------------------------------------------------------------
SPA-4XOC3-POS        SPA FPGA swv3.4         spa  fpga1      3.04      0.0       0.0
-------------------------------------------------------------------------------------------
SPA-OC192POS-XFP     SPA FPGA swv1.2         spa  fpga1      1.02      0.0       0.0
-------------------------------------------------------------------------------------------
SPA-8X1GE            SPA FPGA swv1.8         spa  fpga1      1.08      0.0       0.0
-------------------------------------------------------------------------------------------
SPA-2XOC48POS/RPR    SPA FPGA swv1.0         spa  fpga1      1.00      0.0       0.0
-------------------------------------------------------------------------------------------
SPA-4XOC48POS/RPR    SPA FPGA swv1.0         spa  fpga1      1.00      0.0       0.0
-------------------------------------------------------------------------------------------
SPA-1XOC48POS/RPR    SPA FPGA swv1.2         spa  fpga1      1.02      0.0       0.0
-------------------------------------------------------------------------------------------
SPA-8XOC3-POS        SPA FPGA swv1.0         spa  fpga1      1.00      0.0       0.5
                        SPA FPGA swv1.0         spa  fpga1      1.00      0.0       0.5
-------------------------------------------------------------------------------------------
SPA-2XOC12-POS       SPA FPGA swv1.0         spa  fpga1      1.00      0.0       0.5
-------------------------------------------------------------------------------------------
SPA-4XOC12-POS       SPA FPGA swv1.0         spa  fpga1      1.00      0.0       0.5
-------------------------------------------------------------------------------------------
SPA-10X1GE-V2        SPA FPGA swv1.10        spa  fpga1      1.10      0.0       0.0
-------------------------------------------------------------------------------------------
SPA-8X1GE-V2         SPA FPGA swv1.10        spa  fpga1      1.10      0.0       0.0
-------------------------------------------------------------------------------------------
SPA-5X1GE-V2         SPA FPGA swv1.10        spa  fpga1      1.10      0.0       0.0
-------------------------------------------------------------------------------------------
SPA-1X10GE-L-V2      SPA FPGA swv1.11        spa  fpga1      1.11      0.0       0.0
-------------------------------------------------------------------------------------------
SPA-4XOC3-POS-V2     SPA FPGA swv1.0         spa  fpga1      1.00      0.0       0.5
-------------------------------------------------------------------------------------------
SPA-1X10GE-WL-V2     SPA FPGA swv1.11        spa  fpga1      1.11      0.0       0.0
-------------------------------------------------------------------------------------------
SPA-1XOC3-ATM-V2     SPA FPGA swv1.2         spa  fpga1      2.02      0.0       0.0
-------------------------------------------------------------------------------------------
SPA-2XOC3-ATM-V2     SPA FPGA swv1.2         spa  fpga1      2.02      0.0       0.0
-------------------------------------------------------------------------------------------
SPA-3XOC3-ATM-V2     SPA FPGA swv1.2         spa  fpga1      2.02      0.0       0.0
```

```
------------------------------------------------------------------------------------------
SPA-1XOC12-ATM-V2    SPA FPGA swv1.2          spa  fpga1     2.02       0.0        0.0
------------------------------------------------------------------------------------------
RP/0/RP0/CPU0:a4(admin)#
```

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_r4.0/system_management/command/reference/yr40crs1_chapter8.html

Determining Your Software Version

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-1 show version Output

Step 1 Establish a Telnet session with the router.

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

```
RP/0/RP1/CPU0:router# show version

Cisco IOS XR Software, Version 4.1.1[Default]
Copyright (c) 2011 by Cisco Systems, Inc.

ROM: System Bootstrap, Version 2.04(20110408:051518) [CRS ROMMON],

PE1-A81 uptime is 2 hours, 38 minutes
System image file is "bootflash:disk0/hfr-os-mbi-4.1.1/mbihfr-rp.vm"

cisco CRS-16/S (7457) processor with 4194304K bytes of memory.
7457 processor at 1197Mhz, Revision 1.2
Cisco CRS Series 16 Slots Line Card Chassis

6 Management Ethernet
31 TenGigE
24 GigabitEthernet
37 SONET/SDH
```

```
24 Packet over SONET/SDH
9 Asynchronous Transfer Mode
2 SRP over SONET
1019k bytes of non-volatile configuration memory.
22892M bytes of hard disk.
3607548k bytes of disk0: (Sector size 512 bytes).
3607548k bytes of disk1: (Sector size 512 bytes).


Boot device on node 0/0/CPU0 is mem:
Package active on node 0/0/CPU0:
iosxr-routing, V 4.1.1[00], Cisco Systems, at disk0:iosxr-routing-4.1.1
    Built on Sat Jul 23 00:49:02 PST 2011
    By iox-bld2 in /auto/srcarchive5/production/4.1.1/all/workspace for pie

iosxr-mpls, V 4.1.1[00], Cisco Systems, at disk0:iosxr-mpls-4.1.1
    Built on Sat Jul 23 00:48:42 PST 2011
    By iox-bld2 in /auto/srcarchive5/production/4.1.1/all/workspace for pie

iosxr-mcast, V 4.1.1[00], Cisco Systems, at disk0:iosxr-mcast-4.1.1
    Built on Sat Jul 23 00:48:50 PST 2011
    By iox-bld2 in /auto/srcarchive5/production/4.1.1/all/workspace for pie

iosxr-infra, V 4.1.1[00], Cisco Systems, at disk0:iosxr-infra-4.1.1
    Built on Sat Jul 23 00:49:02 PST 2011
    By iox-bld2 in /auto/srcarchive5/production/4.1.1/all/workspace for pie

iosxr-fwding, V 4.1.1[00], Cisco Systems, at disk0:iosxr-fwding-4.1.1
    Built on Sat Jul 23 00:49:02 PST 2011
    By iox-bld2 in /auto/srcarchive5/production/4.1.1/all/workspace for pie

iosxr-diags, V 4.1.1[00], Cisco Systems, at disk0:iosxr-diags-4.1.1
    Built on Sat Jul 23 00:49:02 PST 2011
    By iox-bld2 in /auto/srcarchive5/production/4.1.1/all/workspace for pie

iosxr-ce, V 4.1.1[00], Cisco Systems, at disk0:iosxr-ce-4.1.1
    Built on Sat Jul 23 00:49:02 PST 2011
    By iox-bld2 in /auto/srcarchive5/production/4.1.1/all/workspace for pie

hfr-services, V 4.1.1[00], Cisco Systems, at disk0:hfr-services-4.1.1
    Built on Sat Jul 23 00:50:41 PST 2011
    By iox-bld2 in /auto/srcarchive5/production/4.1.1/all/workspace for pie

hfr-fwding, V 4.1.1[00], Cisco Systems, at disk0:hfr-fwding-4.1.1
    Built on Sat Jul 23 00:49:02 PST 2011
    By iox-bld2 in /auto/srcarchive5/production/4.1.1/all/workspace for pie

hfr-cgn, V 4.1.1[00], Cisco Systems, at disk0:hfr-cgn-4.1.1
    Built on Sat Jul 23 00:50:41 PST 2011
    By iox-bld2 in /auto/srcarchive5/production/4.1.1/all/workspace for pie

hfr-ce, V 4.1.1[00], Cisco Systems, at disk0:hfr-ce-4.1.1
    Built on Sat Jul 23 00:49:02 PST 2011
    By iox-bld2 in /auto/srcarchive5/production/4.1.1/all/workspace for pie

hfr-sbc, V 4.1.1[00], Cisco Systems, at disk0:hfr-sbc-4.1.1
    Built on Sat Jul 23 00:50:41 PST 2011
    By iox-bld2 in /auto/srcarchive5/production/4.1.1/all/workspace for pie

hfr-fpd, V 4.1.1[00], Cisco Systems, at disk0:hfr-fpd-4.1.1
    Built on Sat Jul 23 01:22:22 PST 2011
    By iox-bld2 in /auto/srcarchive5/production/4.1.1/all/workspace for pie

hfr-diags-supp, V 4.1.1[00], Cisco Systems, at disk0:hfr-diags-supp-4.1.1
    Built on Sat Jul 23 01:22:08 PST 2011
```

```
        By iox-bld2 in /auto/srcarchive5/production/4.1.1/all/workspace for pie

    hfr-diags, V 4.1.1[00], Cisco Systems, at disk0:hfr-diags-4.1.1
        Built on Sat Jul 23 00:50:41 PST 2011
        By iox-bld2 in /auto/srcarchive5/production/4.1.1/all/workspace for pie

    hfr-mcast-supp, V 4.1.1[00], Cisco Systems, at disk0:hfr-mcast-supp-4.1.1
        Built on Sat Jul 23 00:48:50 PST 2011
        By iox-bld2 in /auto/srcarchive5/production/4.1.1/all/workspace for pie

    hfr-mcast, V 4.1.1[00], Cisco Systems, at disk0:hfr-mcast-4.1.1
        Built on Sat Jul 23 00:50:41 PST 2011
        By iox-bld2 in /auto/srcarchive5/production/4.1.1/all/workspace for pie

    hfr-mpls, V 4.1.1[00], Cisco Systems, at disk0:hfr-mpls-4.1.1
        Built on Sat Jul 23 00:50:41 PST 2011
        By iox-bld2 in /auto/srcarchive5/production/4.1.1/all/workspace for pie

    hfr-rout, V 4.1.1[00], Cisco Systems, at disk0:hfr-rout-4.1.1
        Built on Sat Jul 23 00:50:41 PST 2011
        By iox-bld2 in /auto/srcarchive5/production/4.1.1/all/workspace for pie

    hfr-lc, V 4.1.1[00], Cisco Systems, at disk0:hfr-lc-4.1.1
        Built on Sat Jul 23 00:50:41 PST 2011
        By iox-bld2 in /auto/srcarchive5/production/4.1.1/all/workspace for pie

    hfr-fwdg, V 4.1.1[00], Cisco Systems, at disk0:hfr-fwdg-4.1.1
        Built on Sat Jul 23 00:50:41 PST 2011
        By iox-bld2 in /auto/srcarchive5/production/4.1.1/all/workspace for pie

    hfr-admin, V 4.1.1[00], Cisco Systems, at disk0:hfr-admin-4.1.1
        Built on Sat Jul 23 00:50:41 PST 2011
        By iox-bld2 in /auto/srcarchive5/production/4.1.1/all/workspace for pie

    hfr-base, V 4.1.1[00], Cisco Systems, at disk0:hfr-base-4.1.1
        Built on Sat Jul 23 00:49:02 PST 2011
        By iox-bld2 in /auto/srcarchive5/production/4.1.1/all/workspace for pie

    hfr-os-mbi, V 4.1.1[00], Cisco Systems, at disk0:hfr-os-mbi-4.1.1
        Built on Sat Jul 23 00:50:26 PST 2011
        By iox-bld2 in /auto/srcarchive5/production/4.1.1/all/workspace for pie
```

Cisco CRS-3 show version Output

Step 1 Establish a Telnet session with the router.

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

```
RP/0/RP0/CPU0:router# show version

Wed Jul 27 11:27:43.080 PDT

Cisco IOS XR Software, Version 4.1.1[Default]
Copyright (c) 2011 by Cisco Systems, Inc.

ROM: System Bootstrap, Version 2.04(20110407:225207) [CRS ROMMON],

a52-PE2 uptime is 1 day, 6 hours, 53 minutes
System image file is "disk0:hfr-os-mbi-4.1.1/0x100008/mbihfr-rp-x86e.vm"
```

```
cisco CRS-8/S (Intel 686 F6M14S4) processor with 12582912K bytes of memory.
Intel 686 F6M14S4 processor at 1730Mhz, Revision 2.174
Cisco CRS Series 8 Slots Line Card Chassis

2 Management Ethernet
7 T3
18 SONET/SDH
17 Packet over SONET/SDH
24 GigabitEthernet
5 Serial network interface(s)
1 Asynchronous Transfer Mode
1 MgmtMultilink
21 E1
28 T1
245 Serial network interface(s)
74 TenGigE
74 WANPHY controller(s)
1 HundredGigE
1019k bytes of non-volatile configuration memory.
14555M bytes of hard disk.
10449904k bytes of disk0: (Sector size 512 bytes).
10449904k bytes of disk1: (Sector size 512 bytes).

Boot device on node 0/0/SP is bootflash:
Package active on node 0/0/SP:
iosxr-infra, V 4.1.1[00], Cisco Systems, at disk0:iosxr-infra-4.1.1
    Built on Sat Jul 23 05:16:03 PDT 2011
    By iox-bld2 in /auto/srcarchive5/production/4.1.1/all/workspace for pie

iosxr-diags, V 4.1.1[00], Cisco Systems, at disk0:iosxr-diags-4.1.1
    Built on Sat Jul 23 05:16:03 PDT 2011
    By iox-bld2 in /auto/srcarchive5/production/4.1.1/all/workspace for pie

hfr-fpd, V 4.1.1[00], Cisco Systems, at disk0:hfr-fpd-4.1.1
    Built on Sat Jul 23 05:36:05 PDT 2011
    By iox-bld2 in /auto/srcarchive5/production/4.1.1/all/workspace for pie

hfr-diags-supp, V 4.1.1[00], Cisco Systems, at disk0:hfr-diags-supp-4.1.1
    Built on Sat Jul 23 05:35:41 PDT 2011
    By iox-bld2 in /auto/srcarchive5/production/4.1.1/all/workspace for pie

hfr-base, V 4.1.1[00], Cisco Systems, at disk0:hfr-base-4.1.1
    Built on Sat Jul 23 05:16:03 PDT 2011
    By iox-bld2 in /auto/srcarchive5/production/4.1.1/all/workspace for pie

hfr-os-mbi, V 4.1.1[00], Cisco Systems, at disk0:hfr-os-mbi-4.1.1
    Built on Sat Jul 23 05:17:59 PDT 2011
    By iox-bld2 in /auto/srcarchive5/production/4.1.1/all/workspace for pie

Boot device on node 0/0/CPU0 is mem:
Package active on node 0/0/CPU0:
iosxr-ce, V 4.1.1[00], Cisco Systems, at disk0:iosxr-ce-4.1.1
    Built on Sat Jul 23 05:16:03 PDT 2011
    By iox-bld2 in /auto/srcarchive5/production/4.1.1/all/workspace for pie

hfr-ce, V 4.1.1[00], Cisco Systems, at disk0:hfr-ce-4.1.1
    Built on Sat Jul 23 05:16:05 PDT 2011
    By iox-bld2 in /auto/srcarchive5/production/4.1.1/all/workspace for pie

hfr-service-supp, V 4.1.1[00], Cisco Systems, at disk0:hfr-service-supp-4.1.1
    Built on Sat Jul 23 05:36:30 PDT 2011
    By iox-bld2 in /auto/srcarchive5/production/4.1.1/all/workspace for pie
```

```
iosxr-service, V 4.1.1[00], Cisco Systems, at disk0:iosxr-service-4.1.1
    Built on Sat Jul 23 05:36:30 PDT 2011
    By iox-bld2 in /auto/srcarchive5/production/4.1.1/all/workspace for pie

iosxr-mpls, V 4.1.1[00], Cisco Systems, at disk0:iosxr-mpls-4.1.1
    Built on Sat Jul 23 05:15:34 PDT 2011
    By iox-bld2 in /auto/srcarchive5/production/4.1.1/all/workspace for pie

iosxr-mcast, V 4.1.1[00], Cisco Systems, at disk0:iosxr-mcast-4.1.1
    Built on Sat Jul 23 05:15:45 PDT 2011
    By iox-bld2 in /auto/srcarchive5/production/4.1.1/all/workspace for pie

iosxr-routing, V 4.1.1[00], Cisco Systems, at disk0:iosxr-routing-4.1.1
    Built on Sat Jul 23 05:16:03 PDT 2011
    By iox-bld2 in /auto/srcarchive5/production/4.1.1/all/workspace for pie

iosxr-infra, V 4.1.1[00], Cisco Systems, at disk0:iosxr-infra-4.1.1
    Built on Sat Jul 23 05:16:03 PDT 2011
    By iox-bld2 in /auto/srcarchive5/production/4.1.1/all/workspace for pie

hfr-fwding, V 4.1.1[00], Cisco Systems, at disk0:hfr-fwding-4.1.1
    Built on Sat Jul 23 05:16:05 PDT 2011
    By iox-bld2 in /auto/srcarchive5/production/4.1.1/all/workspace for pie

iosxr-fwding, V 4.1.1[00], Cisco Systems, at disk0:iosxr-fwding-4.1.1
    Built on Sat Jul 23 05:16:03 PDT 2011
    By iox-bld2 in /auto/srcarchive5/production/4.1.1/all/workspace for pie

iosxr-diags, V 4.1.1[00], Cisco Systems, at disk0:iosxr-diags-4.1.1
    Built on Sat Jul 23 05:16:03 PDT 2011
    By iox-bld2 in /auto/srcarchive5/production/4.1.1/all/workspace for pie

hfr-fpd, V 4.1.1[00], Cisco Systems, at disk0:hfr-fpd-4.1.1
    Built on Sat Jul 23 05:36:05 PDT 2011
    By iox-bld2 in /auto/srcarchive5/production/4.1.1/all/workspace for pie

hfr-diags-supp, V 4.1.1[00], Cisco Systems, at disk0:hfr-diags-supp-4.1.1
    Built on Sat Jul 23 05:35:41 PDT 2011
    By iox-bld2 in /auto/srcarchive5/production/4.1.1/all/workspace for pie

hfr-mcast-supp, V 4.1.1[00], Cisco Systems, at disk0:hfr-mcast-supp-4.1.1
    Built on Sat Jul 23 05:15:45 PDT 2011
    By iox-bld2 in /auto/srcarchive5/production/4.1.1/all/workspace for pie

hfr-base, V 4.1.1[00], Cisco Systems, at disk0:hfr-base-4.1.1
    Built on Sat Jul 23 05:16:03 PDT 2011
    By iox-bld2 in /auto/srcarchive5/production/4.1.1/all/workspace for pie

hfr-os-mbi, V 4.1.1[00], Cisco Systems, at disk0:hfr-os-mbi-4.1.1
    Built on Sat Jul 23 05:17:59 PDT 2011
    By iox-bld2 in /auto/srcarchive5/production/4.1.1/all/workspace for pie

Boot device on node 0/1/SP is bootflash:
Package active on node 0/1/SP:
iosxr-infra, V 4.1.1[00], Cisco Systems, at disk0:iosxr-infra-4.1.1
    Built on Sat Jul 23 05:16:03 PDT 2011
    By iox-bld2 in /auto/srcarchive5/production/4.1.1/all/workspace for pie

iosxr-diags, V 4.1.1[00], Cisco Systems, at disk0:iosxr-diags-4.1.1
    Built on Sat Jul 23 05:16:03 PDT 2011
    By iox-bld2 in /auto/srcarchive5/production/4.1.1/all/workspace for pie

hfr-fpd, V 4.1.1[00], Cisco Systems, at disk0:hfr-fpd-4.1.1
    Built on Sat Jul 23 05:36:05 PDT 2011
```

```
        By iox-bld2 in /auto/srcarchive5/production/4.1.1/all/workspace for pie

hfr-diags-supp, V 4.1.1[00], Cisco Systems, at disk0:hfr-diags-supp-4.1.1
        Built on Sat Jul 23 05:35:41 PDT 2011
        By iox-bld2 in /auto/srcarchive5/production/4.1.1/all/workspace for pie

hfr-base, V 4.1.1[00], Cisco Systems, at disk0:hfr-base-4.1.1
        Built on Sat Jul 23 05:16:03 PDT 2011
        By iox-bld2 in /auto/srcarchive5/production/4.1.1/all/workspace for pie

hfr-os-mbi, V 4.1.1[00], Cisco Systems, at disk0:hfr-os-mbi-4.1.1
        Built on Sat Jul 23 05:17:59 PDT 2011
        By iox-bld2 in /auto/srcarchive5/production/4.1.1/all/workspace for pie

Boot device on node 0/1/CPU0 is mem:
Package active on node 0/1/CPU0:
iosxr-ce, V 4.1.1[00], Cisco Systems, at disk0:iosxr-ce-4.1.1
        Built on Sat Jul 23 05:16:03 PDT 2011
        By iox-bld2 in /auto/srcarchive5/production/4.1.1/all/workspace for pie

hfr-ce, V 4.1.1[00], Cisco Systems, at disk0:hfr-ce-4.1.1
        Built on Sat Jul 23 05:16:05 PDT 2011
        By iox-bld2 in /auto/srcarchive5/production/4.1.1/all/workspace for pie

hfr-service-supp, V 4.1.1[00], Cisco Systems, at disk0:hfr-service-supp-4.1.1
        Built on Sat Jul 23 05:36:30 PDT 2011
        By iox-bld2 in /auto/srcarchive5/production/4.1.1/all/workspace for pie

iosxr-service, V 4.1.1[00], Cisco Systems, at disk0:iosxr-service-4.1.1
        Built on Sat Jul 23 05:36:30 PDT 2011
        By iox-bld2 in /auto/srcarchive5/production/4.1.1/all/workspace for pie

iosxr-mpls, V 4.1.1[00], Cisco Systems, at disk0:iosxr-mpls-4.1.1
        Built on Sat Jul 23 05:15:34 PDT 2011
        By iox-bld2 in /auto/srcarchive5/production/4.1.1/all/workspace for pie

iosxr-mcast, V 4.1.1[00], Cisco Systems, at disk0:iosxr-mcast-4.1.1
        Built on Sat Jul 23 05:15:45 PDT 2011
        By iox-bld2 in /auto/srcarchive5/production/4.1.1/all/workspace for pie

iosxr-routing, V 4.1.1[00], Cisco Systems, at disk0:iosxr-routing-4.1.1
        Built on Sat Jul 23 05:16:03 PDT 2011
        By iox-bld2 in /auto/srcarchive5/production/4.1.1/all/workspace for pie

iosxr-infra, V 4.1.1[00], Cisco Systems, at disk0:iosxr-infra-4.1.1
        Built on Sat Jul 23 05:16:03 PDT 2011
        By iox-bld2 in /auto/srcarchive5/production/4.1.1/all/workspace for pie

hfr-fwding, V 4.1.1[00], Cisco Systems, at disk0:hfr-fwding-4.1.1
        Built on Sat Jul 23 05:16:05 PDT 2011
        By iox-bld2 in /auto/srcarchive5/production/4.1.1/all/workspace for pie

iosxr-fwding, V 4.1.1[00], Cisco Systems, at disk0:iosxr-fwding-4.1.1
        Built on Sat Jul 23 05:16:03 PDT 2011
        By iox-bld2 in /auto/srcarchive5/production/4.1.1/all/workspace for pie

iosxr-diags, V 4.1.1[00], Cisco Systems, at disk0:iosxr-diags-4.1.1
        Built on Sat Jul 23 05:16:03 PDT 2011
        By iox-bld2 in /auto/srcarchive5/production/4.1.1/all/workspace for pie

hfr-fpd, V 4.1.1[00], Cisco Systems, at disk0:hfr-fpd-4.1.1
        Built on Sat Jul 23 05:36:05 PDT 2011
        By iox-bld2 in /auto/srcarchive5/production/4.1.1/all/workspace for pie
```

```
hfr-diags-supp, V 4.1.1[00], Cisco Systems, at disk0:hfr-diags-supp-4.1.1
    Built on Sat Jul 23 05:35:41 PDT 2011
    By iox-bld2 in /auto/srcarchive5/production/4.1.1/all/workspace for pie

hfr-mcast-supp, V 4.1.1[00], Cisco Systems, at disk0:hfr-mcast-supp-4.1.1
    Built on Sat Jul 23 05:15:45 PDT 2011
    By iox-bld2 in /auto/srcarchive5/production/4.1.1/all/workspace for pie

hfr-base, V 4.1.1[00], Cisco Systems, at disk0:hfr-base-4.1.1
    Built on Sat Jul 23 05:16:03 PDT 2011
    By iox-bld2 in /auto/srcarchive5/production/4.1.1/all/workspace for pie

hfr-os-mbi, V 4.1.1[00], Cisco Systems, at disk0:hfr-os-mbi-4.1.1
    Built on Sat Jul 23 05:17:59 PDT 2011
    By iox-bld2 in /auto/srcarchive5/production/4.1.1/all/workspace for pie
```

New Cisco CRS Router Software Features

This section contains the new software features that were introduced in Cisco IOS XR Software Release 4.1.1 on the Cisco CRS platform.

Note Cisco Session Border Controller (SBC) is not supported on any platform in Cisco IOS XR Software Release 4.1.1. Cisco IOS XR Software Release 3.7 is the last release that supports SBC.

Event Dampening

The restart-penalty option was added to the **dampening** command to avoid unnecessary re-convergence.

In a MPLS-TE environment, sometimes after boot up, the head-end router fails to select the first explicit-path option, and the second path-option is used. The goal of the behavior after bootup is to establish the TE tunnels immediately. But, unnecessary re-optimization is required to use the first path.

If the dampening restart-option is configured on the backup interface, the IGP adjacencies on the primary interface come up first. And, the first path-option is always picked after reboot.

> **dampening** [<*half-life*> [<*reuse*> <*suppress*> <*max suppress*> [<*restart penalty*>]]]

Syntax Description		
restart-penalty		Penalty to applied to the interface when it comes up for the first time after the router reloads. The configurable range is from 1 to 20000 penalties. The default is 2000 penalties. This argument is not required for any other configurations.

To manually configure the timer for the restart-penalty argument, the value for all other arguments must be manually entered.

For more information about the other optional arguments of the **dampening** command, refer to the Global Interface Commands on the Cisco IOS XR Software section of the *Cisco IOS XR Interface and Hardware Component Command Reference for the Cisco CRS Router.*

Label Switched Multicast (LSM) Multicast Label Distribution Protocol (mLDP) based Multicast VPN (mVPN) support

Label Switch Multicast (LSM) is MPLS technology extensions to support multicast using label encapsulation. CRS next generation MVPN is based on Multicast Label Distribution Protocol (mLDP), which can be used to build P2MP and MP2MP LSPs through a MPLS network. These LSPs can be used for transporting both IPv4 and IPv6 multicast packets, either in the global table or VPN context. mLDP is complementary to the Cisco LSM strategy.

For more information about this feature, refer to the Implementing Layer-3 Multicast Routing on Cisco IOS XR Software section of the *Cisco IOS XR Software Multicast Configuration Guide for the Cisco CRS Router.*

mLDP OAM

Cisco IOS XR software Release 4.1.1 adds OAM functions for mLDP.

To execute ping for a specified mLDP tree, use the following command:

> **ping mpls mldp** [p2mp | mp2mp] *<root> <opaque types>* [*options*]

To execute trace for a specified mLDP tree, use the following command:

> **trace mpls mldp** [p2mp | mp2mp] *<root> <opaque types>* [*options*]

Both commands use the same syntax.

Syntax Description	[p2mp	mp2mp]	Type of tree on which the ping is performed.
	root	Address of the root in the tree. In Cisco IOS XR software Release 4.1.1, IPv4 is only supported.
	opaque types	Set of opaque types and their subsequent parameters : • ipv4 <rd> <source> <group> [options] • ipv6 <rd> <source> <group> [options] • hex <opaque type> <opaque value> [options] • mdt <vpnid> <mdt_num> [options] • static <lsp identifier> [options] (Cisco support) • global-id <global identifier> [options]
	options	Regular ping/trace options.

MPLS TTL Propagate

This controls the generation of the time-to-live (TTL) field in the Multiprotocol Label Switching (MPLS) header when labels are first added to an IP packet.

The following command is introduced on the Cisco IOS XR Software Release 4.1.1:

> **mpls ip propagate-ttl** [*forwarded* | *local*]

Use the this command in global configuration mode. To use a fixed TTL value (255) for the first label of the IP packet, use the no form of this.

BGP Accept Own

This feature allows movement from a PE-Based service provisioning model to a centralized router reflector (RR)-based service provisioning model. With this feature, you can define route TO service-VRF mapping within a centralized route reflector and then propagate this information down to all the PE clients of that RR. Without this feature, you would define the route TO service VRF mapping in all PE devices, thereby incurring a high configuration overhead, which could result in more errors.

This feature enables a route reflector to modify the Route Target (RT) list of a VPN route that is distributed by the route reflector, enabling the route reflector to control how a route originated within one VRF is imported into other VRFs.

1-Port Channelized OC12 to DS0 SPA Support for MR-APS, Multilink MLP/LFI, Basic QoS

The Channelized Cisco 1-Port Channelized OC12 to DS0 SPA (SPA-1XCHOC12/DS0) is a full height (FH) high power (HP) SPA that provide channelized services over OC-12 SONET/SDH pipes. This SPA occupies two bays.

This SPA supports the SFP optics with single-mode (SM) and multi-mode (MM) including SR, IR1, LR1, and LR2 ranges.

The Cisco 1-Port Channelized OC12 to DS0 SPA is only supported with CRS1-SIP-800 and CRS-MSC-B.

This SPA is not supported on the FP-40 or other Flex PLIMs in Cisco IOS XR Release 4.1.1.

The following channelization modes are supported:

- SONET
    - STS-12c
    - STS-3c
    - STS-1
    - STS-1->DS3
    - STS-1->DS3->T1->NxDS0
    - STS-1->DS3->E1->NxDS0
    - STS-1->VT1.5->T1->NxDS0
- SDH
    - AU-4-4c (VC-4-4c)
    - AU-4 (VC-4)
    - AU-4->TUG-3->VC-3->DS3
    - AU-4->TUG-3->VC-3->E3
    - AU-4->TUG-3->TUG-2->VC-11->T1->NxDS0
    - AU-4->TUG-3->TUG-2->VC-12->E1->NxDS0

- AU-3->VC-3->DS3

- AU-3->TUG-2->VC-11->T1->NxDS0

- AU-3->TUG-2->VC-12->E1->NxDS0

The features listed in this section are now supported on the Cisco 1-Port Channelized OC12 to DS0 SPA.

MLPP

MLPPP is based on the IETF standard RFC1990. The RFC addresses both link aggregation and LFI by extending the PPP Link Control Protocol (LCP) to allow both fragmentation and bundling options to be negotiated along with other PPP session setup options.

MLPPP bundles allow aggregation of low bandwidth serial links into bundled interfaces to provide higher rates of service.

MLPPP bundle interface is another interface with PPP encapsulation. The only speciality with this interface is that its bandwidth can be changed dynamically. Configure features only on the bundle interface. Do not configure member interfaces with any L3 features, including QOS, because they are blocked on members.

Sequence numbers are used to re-order the packets on the receiving end as data traffic can use any members of the bundle. In CRS, these activities are performed within the SPA. These interfaces have their own allocated resources.

Control traffic runs on the bundle and member interfaces. This control traffic cannot choose any random member for the transmission. Heartbeat packets are transmitted and received only on those member interfaces designated for the control traffic.

For information about the supported commands, refer to the *Cisco IOS XR Interface and Hardware Component Command Reference for the Cisco CRS Router.*

Limitations

Cisco CRS allows only full T1/E1 serial links as member interfaces for the MLPPP bundle. The maximum number of members or links that can be attached to one MLPPP is 12. The minimum number of members is one for the MLPPP bundle interface to be up.

For Channelized SPA placed in Bay 0 and 2:

- Maximum number of interfaces supported: 255

- Maximum number of MLPPP bundles supported: 85 with two members in each MLPPP bundle (85 MLPPP interfaces + 85*2 (total members) = 255)

  If 12 members need to be configured, ensure that the total number of MLPPP bundle interfaces and members together do not exceed the 255 interface limit.

For Channelized SPA placed in Bay 1:

- Maximum number of interfaces supported: 127

- Maximum number of MLPPP bundles supported : 42 with two members in each MLPPP bundle (42 MLPPP interfaces + 42 *2 (total members) = 126)

  If 12 members need to be configured, ensure the total number of MLPPP bundle interfaces and the members together do not exceed the 127 interface limit.

Use the following formula to find the maximum MLPPP bundle interfaces that can be created per SPA if the number of bundle members is known. For example:

maximum MLPPP interfaces with 2 members = 255 (Total max scale supported) / (1 +number of members) = 255/ (1+2) = 85

Restrictions

In Cisco IOS XR Release 4.1.1 on Cisco CRS, the following hybrid models in member interface types are not supported:

- T1 and E1 serial interfaces are not allowed under the same bundle interface.
- Members with different bandwidth values are not supported.
- Bundle member interfaces across different controllers and SPAs are not supported.
- The maximum number of member interfaces that can be attached to the multilink bundle cannot exceed 12.
- The minimum number of member interfaces is one member for the protocol to be active under MLPPP interface.

  Typically at least two member links are on the bundle interface. However, if you need to maintain a minimum amount of bandwidth on a multilink and the bandwidth is not available, you can bring down the bundle interface and reconfigure the number of active links by using the **ppp multilink minimum-active links** command under the bundle. As long as the minimum number of members are active, the bundle interface stays up.

- All of the channelized interfaces on the same SPA share the same fabric queues.
- If the interface cannot be created, the controller configuration for POS and Serial modes can be successful. Undo the configuration on the controller if the interface creation failure is because the number of interfaces created reached the limit.
- IMDR or ISSU for the Cisco 1-Port Channelized OC12 to DS0 SPA is not supported since it is an intelligent SPA.

MLPPP Bundle Dynamic Bandwidth Changes

Bundle members can become ACTIVE or INACTIVE dynamically by adding or removing members from the bundle interface. Bundle interface bandwidth changes dynamically based on the addition or removal of the members. Platform resources update these bandwidth changes accordingly.

When QoS policy-map is applied on the bundle, it is recommended to use percentage based bandwidth instead of absolute numbers.

> **Note** In Cisco IOS XR software Release 4.1.1, absolute values are not supported in QoS policy-map configurations.

L2 Load Balance of Traffic under MLPPP Bundle Members

User data traffic can choose any member under the multilink bundle for transmission. However, the Cisco 1-Port Channelized OC12 to DS0 SPA has a specific algorithm in choosing the member links.

Traffic should be evenly distributed across all the member links when the bundle is not oversubscribed. In the case of over subscription, one of the member links is used as a reference to trigger the back pressure on the bundle interface threshold level.

BFD on Multilink Interfaces

Cisco recommends using small BFD timer to detect any interface failure. However, PPP does not support the small keepalive timer. This causes some BFD flap even when the bundle interface stays UP.

PPP LCP timer values are maintained in seconds, but BFD is configured in msec. In some cases when the member interfaces are shut on one end or the physical link goes down, PPP takes time to detect this to bring this member INACTIVE. In the mean time, BFD packets are queued up on these member links and get dropped. This causes the bundle interface flap affecting the user data traffic.

The workaround is to shutdown the member interfaces on both the ends simultaneously to avoid such flaps. This is the limitation and is described under CSCtl78508: BFD flapped when shutting the MLPPP member links.

LFI

Link Fragmentation Interleave (LFI) is done as a special case of a single link bundle where high priority packets , classified and managed by QoS, can be inserted as plain PPP packets between fragments of normal priority packets.

LFI is a technique used on slow speed (full T1/E1 or fractional T1/E1) links to fragment large data packets and insert real time (for example, VoIP) packets between these fragments to reduce jitter and preserve end-to-end quality of the real time services.

MLPPP LFI feature can be configured only on the bundle interface. Only one member link can be attached to the bundle interface with LFI enabled. Either full T1/E1 or fractional T1/E1 interfaces are allowed as   a member of LFI bundle interface.

For Channelized SPA placed in Bay 0 and 2:

- Maximum number of interfaces supported: 255

- Maximum number of MLPPP LFI bundles supported: 127 with one member in each MLPPP LFI bundle (127 MLPPP LFI interfaces + 127*1 (total members) = 254 interfaces)

  Ensure that the total number of MLPPP LFI bundle interfaces and the members together do not exceed the 255 interface limit.

For Channelized SPA placed in Bay 1:

- Maximum number of interfaces supported: 127

- Maximum number of MLPPP bundles supported: 63 with one member in each MLPPP LFI bundle (63 MLPPP LFI interfaces + 63 *1 (total members) = 126 interfaces)

  Ensure that the total number of MLPPP bundle interfaces and the members together do not exceed the 127 interface limit.

MLPPP LFI bundle creation is the same as MLPPP bundle creation. For the LFI bundle interfaces, enable multilink interleave under the LFI bundle interface.

LFI is required when integrating voice and data on low speed interfaces, so apply a QoS policy-map on the egress or ingress direction that has both voice class and data class defined. Channelized SPA supports L2 fragment sizes 64, 128, 256 and 512.

For information about the supported commands, refer to the *Cisco IOS XR Interface and Hardware Component Command Reference for the Cisco CRS Router.*

For information about QoS, refer to the *Cisco IOS XR Modular Quality of Service Configuration Guide for the Cisco CRS Router.*

MR-APS

Multi router-Automatic Protection Switching (MR-APS) is used for protecting SONET channels in the event of a fiber, channel, or controller failure and is standardized to allow interworking between other SONET channels from different suppliers.

The two MR-APS architectures available are

- 1:1

- 1:n.

MR-APS linear APS is applicable to the line level, and the protection is for all the STS paths carried by the SONET channel. When an APS switch occurs, all of the controllers, interfaces, subinterfaces (STS paths, T1/E1/DS3/DS1 and so forth) are switched simultaneously.

On Cisco CRS-1 platform, only MR-APS 1:1 is supported for Cisco 1-Port Channelized OC12 to DS0 SPA and supports all the existing functionality.

For more information, refer to the *Cisco IOS XR Interface and Hardware Component Configuration Guide for the Cisco CRS Router.*

TE Auto-tunnel Mesh

This feature introduces dynamically generated tunnel interfaces to reduce config scale. Rather than configuring each tunnel interface under LDP, you can configure only mesh groups in LDP. LDP dynamically learns the tunnel interfaces belonging to each auto-tunnel mesh group.

Each of these dynamically learned tunnel interfaces are treated exactly the same as if it was configured under LDP.

ICMPv6 Source Selection

ICMPv6 Source Selection—This feature allows for flexible source IP address selection in the Internet Control Message Protocol (ICMP) response packet in response to a failure.

The following command is introduced in this release to support this feature:

icmp [**ipv4** | **ipv6**] **source** [**vrf** | **rfc**]

- icmp ipv6 source vrf

    This policy selects the source address corresponding to strict vrf in outgoing IPv6 ICMP packets.

- icmp ipv6 source rfc

    This policy selects the source address corresponding to RFC 3484 in outgoing IPv6 ICMP packets.

Cisco CRS-CGSE-PLIM

The following features are supported on the Cisco CRS-1 Series Carrier Grade Service Engine PLIM in Cisco IOS XR software Release 4.1.1:

- Carrier Grade NAT

- IPv6 Rapid Deployment (6rd) Border Relay

- Stateless NAT64

For licensing information, see the "CRS CGSE-PLIM Licenses" section on page 13.

Cisco CRS-3 SW Features

Note With Cisco IOS XR Release 4.1.0 PX, the CRS MSC-140 or CRS FP-140 can now be used for Provider (P) and Provider Edge (PE) Layer 3 router configurations, including Layer 3 VPN features. With Cisco IOS XR Release 4.1.0, CRS MSC-140 or CRS FP-140 now supports Layer 2 VPN functionality. Please contact your Cisco representative for more information.

The following features are now supported on the Cisco CRS-3 Router in Cisco IOS XR Software Release 4.1.1:

- **Access Control List (ACL) Chaining**—This feature allows you to configure one common ACL to be shared among many interfaces. This common ACL is to be used to protect a backbone infrastructure while allowing easier security management.

  The ACL Chaining feature extends the existing access-group command to accept a common ACL along with the interface specific ACL. The following commands are modified:

  - ipv4 access-group, page 37
  - ipv6 access group, page 39

ipv4 access-group

To control access to an interface, use the **ipv4 access-group** command in interface configuration mode. To remove the specified access group, use the **no** form of this command.

ipv4 access-group { **common** <acl-p> { [<acl1> **ingress** [interface-statistics]] | **ingress** } | <acl1> { ingress | egress } [interface-statistics] } [hardware-count]

no ipv4 access-group { **common** <acl-p> { [<acl1> **ingress** [interface-statistics]] | **ingress** } | <acl1> { ingress | egress } [interface-statistics] } [hardware-count]

Syntax Description

access-list-name	The name of the ipv4 access list as specified by the ipv4 access-list command.
common	The name of the common ACL. Common ACL is only supported on the ingress direction.
acl-p	The common access-list name.
acl1	The interface access-list name.
ingress	Filters on inbound packets.
egress	Filters on outbound packets.
hardware-count	(Optional) Specifies to access a group's hardware counters.
interface-statistics	(Optional) Specifies per-interface statistics in the hardware. Not available for common ACL.

Defaults The interface does not have an IPv4 access list applied to it.

Command Modes   Interface Configuration

Command History

Release	Modification
Release 3.9.2	This command was modified on the Cisco CRS Routers.
Release 4.1.1	The acl-p and acl1 arguments were added.

Usage Guidelines   To use this command, you must be in a user group associated with a task group that includes the proper task IDs. If you suspect user group assignment is preventing you from using a command, contact your AAA administrator.

Use the ipv4 access-group command to control access to an interface. To remove the specified access group, use the no form of the command. Use the access-list-name argument to specify a particular IPv4 access list. Use the ingress keyword to filter on inbound packets or the egress keyword to filter on outbound packets. Use the hardware-count argument to enable hardware counters for the access group.

Permitted packets are counted only when hardware counters are enabled using the hardware-count argument. Denied packets are counted whether hardware counters are enabled or not.

Note   For packet filtering applications using the ipv4/ipv6 access-group command, packet counters are maintained in hardware for each direction. If an access group is used on multiple interfaces in the same direction, then packets are counted for each interface that has the hardware-count argument enabled.

If the access list permits the addresses, the software continues to process the packet. If the access list denies the address, the software discards the packet and returns an Internet Control Message Protocol (ICMP) host unreachable message.

If the specified access list does not exist, all packets are passed.

By default, the unique or per-interface ACL statistics are disabled.

Task ID

Task ID	Operations
acl	read, write
network	read, write

Examples   Following is an example of the show access-lists command:

```
DRP/0/4/CPU0:router# show access-lists
Tue Jun 22 05:30:17.739 DST
ipv4 access-list acl-common
 10 permit ipv4 host 205.205.205.1 host 200.175.175.1 log-input
 15 deny ipv4 any host 200.175.175.1
 20 permit ipv4 host 205.205.205.1 host 201.175.175.1 log-input
 25 deny ipv4 any host 201.175.175.1
 30 permit ipv4 host 205.205.205.1 host 202.175.175.1 log-input
 35 deny ipv4 any host 202.175.175.1
ipv4 access-list acl-unique1
 10 permit ipv4 host 205.205.205.1 host 203.175.175.1 log-input
 15 deny ipv4 any host 203.175.175.1
 20 permit ipv4 any any
```

```
ipv4 access-list ssm-acl
 10 permit ipv4 232.0.0.0 0.255.255.255 any log
```

Following in an example of a configured IPv4 ACL:

```
DRP/0/4/CPU0:router(config-if)# ipv4 access-group common acl-common acl-unique1
ingress
```

ipv6 access group

To control access to an interface, use the **ipv6 access-group** command in interface configuration mode. To remove the specified access group, use the **no** form of this command.

> **ipv6 access-group { common** <acl-p> **{ [**<acl1> **ingress [**interface-statistics**]] | ingress } |** <acl1> { ingress | egress } [interface-statistics] }

> **no ipv6 access-group { common** <acl-p> **{ [**<acl1> **ingress [**interface-statistics**]] | ingress } |** <acl1> { ingress | egress } [interface-statistics] }

Syntax Description		
	access-list-name	The name of the ipv4 access list as specified by the ipv4 access-list command.
	common	The name of the common ACL. Common ACL is only supported on the ingress direction.
	acl-p	The common access-list name.
	acl1	The interface access-list name.
	ingress	Filters on inbound packets.
	egress	Filters on outbound packets.
	interface-statistics	(Optional) Specifies per-interface statistics in the hardware. Not available for common ACL.

Defaults The interface does not have an IPv6 access list applied to it.

Command Modes Interface Configuration

Command History	Release	Modification
	Release 3.9.2	This command was modified on the Cisco CRS Routers.
	Release 4.1.1	The acl-p and acl1 arguments were added.

Usage Guidelines To use this command, you must be in a user group associated with a task group that includes the proper task IDs. If you suspect user group assignment is preventing you from using a command, contact your AAA administrator.

The ipv6 access-group command is similar to the ipv4 access-group command, except that it is IPv6-specific.

Use the ipv6 access-group command to control access to an interface. To remove the specified access group, use the no form of the command. Use the access-list-name to specify a particular IPv6 access list. Use the ingress keyword to filter on inbound packets or the egress keyword to filter on outbound packets.

Note For packet filtering applications using the ipv6 access-group command, packet counters are maintained in hardware for each direction. If an access group is used on multiple interfaces in the same direction, then packets are counted for each interface.

If the access list permits the addresses, the software continues to process the packet. If the access list denies the address, the software discards the packet and returns a rate-limited Internet Control Message Protocol (ICMP) host unreachable message.

If the specified access list does not exist, all packets are passed.

By default, the unique or per-interface ACL statistics are disabled.

Task ID	Task ID	Operations
	acl	read, write
	ipv6	read, write

Examples Following is an example of the show access command:

```
DRP/0/4/CPU0:router# show access ipv6
Tue Jun 22 12:20:57.817 DST
ipv6 access-list acl-common-v6
 10 permit ipv6 host 2001:db8::202:202:202:202 host 2001:db8::204:175:175:1 log-input
 15 deny ipv6 any host 2001:db8::204:175:175:1
 20 permit ipv6 host 2001:db8::202:202:202:202 host 2001:db8::205:175:175:1 log-input
 25 deny ipv6 any host 2001:db8::205:175:175:1
 30 permit ipv6 host 2001:db8::202:202:202:202 host 2001:db8::206:175:175:1 log-input
 35 deny ipv6 any host 2001:db8::206:175:175:1
ipv6 access-list acl-unique1-v6
 10 permit ipv6 host 2001:db8::202:202:202:202 host 2001:db8::207:175:175:1 log-input
 15 deny ipv6 any host 2001:db8::207:175:175:1
 20 permit ipv6 any any
```

Following in an example of a configured IPv6 ACL:

```
DRP/0/4/CPU0:router(config-if)# ipv6 access-group common acl-common-v6 acl-unique1-v6
ingress
```

- **Ethernet OAM**—For more information on E-OAM, refer to the Configuring Ethernet OAM on Cisco IOS XR Software section of the *Cisco IOS XR Interface and Hardware Component Configuration Guide for the Cisco CRS Router.*

- **BGP Accept Own**—See description in BGP Accept Own, page 32.

- **Event Dampening**—See description in Event Dampening, page 30.

- **L2VPN Support**—For information about these features, refer to the Implementing MPLS Layer 2 VPNs section of the *Cisco IOS XR Virtual Private Network Configuration Guide for the Cisco CRS Router.*

- **mLDP-Based MVPN**—For information about these features, refer to the Implementing Layer-3 Multicast Routing on Cisco IOS XR Software section of the *Cisco IOS XR Software Multicast Configuration Guide for the Cisco CRS Router.*

- **MPLS TTL Propagate**—See description in .

- **VPLS**—For information about these features, refer to the Implementing Virtual Private LAN Services section of the *Cisco IOS XR Virtual Private Network Configuration Guide for the Cisco CRS Router.*

New Hardware Features for the Cisco CRS Router

The following new hardware features were introduced in Cisco IOS XR Software Release 4.1.1 on the Cisco CRS Router:

- Cisco CRS-LSP Label Switch Processor (CRS-LSP)

    The Label Switch Processor (LSP) is optimized for MPLS label switching function in the CRS family. It is powered by QuantumFlow Array- the chip set architecture that provides single-flow Layer 3 traffic processing at 140 Gbps in each direction, as opposed to multiplexing various flows, to reach high bandwidths. It offers high scalability, supporting LSPs upwards of 100 thousand TE midpoints, 1M labels for variety of MPLS applications in the core such as RSVP-TE, LDP, Multicast-LDP.

    The LSP card is one of the 3 service cards in the CRS family. The MSC service card is designed for core aggregation, multi services edge position of the network needing high number of queues such as 64000 with hierarchical QoS capability.

    The FP service card is designed for peering and the thin core position in the network which requires high internet table scale and port level QoS such as 8 queues/port.

    The LSP service card is designed for a lean core or an inner core architecture where the traffic type is primarily MPLS with high label switch path scale and an optimized IP forwarding scale.

    The LSP service card occupies the back of a slot, just like the FP/MSC, while the Physical Line Interface Module (PLIM) occupies the front slot. It can be paired with any of the three existing CRS-3 PLIMs:

    - 1-port 100 GigE
    - 14-port 10 GigE LAN/WAN-PHY
    - 20-port 10 GigE LAN/WAN-PHY

    For more information about this line card, refer to the following documents:

    - *Cisco CRS Carrier Routing System 4-Slot Line Card Chassis System Description*
    - *Cisco CRS Carrier Routing System 4-Slot Line Card Chassis Installation Guide*
    - *Cisco CRS Carrier Routing System 8-Slot Line Card Chassis System Description*
    - *Cisco CRS Carrier Routing System 8-Slot Line Card Chassis Installation Guide*
    - *Cisco CRS Carrier Routing System 16-Slot Line Card Chassis System Description*
    - *Cisco CRS Carrier Routing System 16-Slot Line Card Chassis Installation Guide*

- 1-Port Channelized OC12 to DS0 SPA

- CRS-FP40 as a back card for the CRS-CGSE-PLIM

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-1 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-1 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 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 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 4.1.1. 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>

- Optics Supported in Cisco IOS XR software Release 4.1.1—See Table 6.

Table 6   Optics Supported in Cisco IOS XR Release 4.1.1

PLIM/SPA	Optics Supported
4-10GBE-WL-XFP 8-10GBE-WL-XFP	XFP-10GLR-192SR-L XFP-10GER-192IR-L XFP-10G-MM-SR XFP-10GZR-OC192LR DWDM-XFP
14x10GBE-WL-XFP 20X10GBE-WL-XFP	XFP10GLR-192SR-L XFP10GER-192IR-L XFP-10G-MM-SR XFP-10GZR-OC192LR DWDM-XFP

Table 6 Optics Supported in Cisco IOS XR Release 4.1.1

PLIM/SPA	Optics Supported
2-10GE-WL-FLEX	XFP-10G-MM-SR
	XFP-10GLR-OC192SR
	XFP-10GER-192IR+
	XFP-10GZR-OC192LR
	DWDM-XFP
SPA-1X10GE-WL-V2	XFP-10G-MM-SR
	XFP-10GLR-OC192SR
	XFP-10GER-192IR+
	XFP-10GZR-OC192LR
	DWDM-XFP

DWDM-XFP listed in includes any one of the DWDM-XFPs listed in .

Table 7 DWDM XFPs

DWDM-XFP-30.33	DWDM-XFP-38.19	DWDM-XFP-48.51
DWDM-XFP-60.61	DWDM-XFP-38.98	DWDM-XFP-51.72
DWDM-XFP-50.92	DWDM-XFP-39.77	DWDM-XFP-52.52
DWDM-XFP-50.12	DWDM-XFP-40.56	DWDM-XFP-54.13
DWDM-XFP-31.12	DWDM-XFP-42.14	DWDM-XFP-54.94
DWDM-XFP-31.90	DWDM-XFP-42.94	DWDM-XFP-55.75
DWDM-XFP-32.68	DWDM-XFP-43.73	DWDM-XFP-56.55
DWDM-XFP-34.25	DWDM-XFP-44.53	DWDM-XFP-58.17
DWDM-XFP-35.04	DWDM-XFP-46.12	DWDM-XFP-58.98
DWDM-XFP-35.82	DWDM-XFP-46.92	DWDM-XFP-59.79
DWDM-XFP-36.61	DWDM-XFP-47.72	

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.

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-1 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 4.1.1

Cisco IOS XR Software Release 4.1.1 requires a 2-GB Flash Disk as a minimum. If your Cisco CRS currently uses a 1-GB Flash Disk, you must upgrade it to 2-GB before upgrading to Cisco IOS XR Software Release 4.1.1. The PCMCIA 1-GB Flash Disk was the default size for the Cisco CRS running Cisco IOS XR Software Release 3.6 and earlier.

In Cisco IOS XR Software Release 3.6 and later releases, disk partitioning is supported. Partitioning of a 2-GB disk is possible but not required. Partitioning of a 4-GB disk is required.

A 4-GB Flash Disk can be installed instead of the 2-GB for greater disk storage.

To upgrade from a 1-GB flash disk to a 2-GB or 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

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 Release 4.1.1 software 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 4.1.1 and are not platform specific:

- **CSCto72695**

  Basic Description:

  RR sending full vpn table to PE though no route-refresh from PE.

  Symptom:

  RR sends a full vpn table although RT Constraint is configured between RR and PE.

On the RR, the "show bgp neighbor" counters for advertised prefixes increment correspondingly to reflect a large number of prefixes advertised to PE.

Conditions:

This issue occurs when a VRF on the PE is unconfigured and reconfigured within a short interval.

Workaround:

Have a interval of approximately one minute before reconfiguring a VRF after unconfiguring it.

Recovery:

No recovery is necessary if the workaround is used.

- **CSCto99989**

  Basic Description:

  SNMP bulk config, or load from saved config, or rollback will show error

  Symptom:

  SNMP bulk configuration, or load from saved configuration, or rollback (which include multiple SNMP commands) can cause following messages to print on console.

  RP/0/RSP0/CPU0:Apr 27 19:26:59.446 : snmpd[1112]: %SNMP-SNMP-4-VIEWOID_NOT_FOUND : The command "snmp view li-view ifMIB included" could not be applied at this time because the oid "ifMIB" does not belong to a known MIB module.

  RP/0/RSP0/CPU0:Apr 27 19:26:59.481 : snmpd[1112]: %SNMP-SNMP-4-VIEWOID_NOT_FOUND : The command "snmp view li-view ciscoTap2MIB included" could not be applied at this time because the oid "ciscoTap2MIB" does not belong to a known MIB module.

  RP/0/RSP0/CPU0:Apr 27 19:26:59.495 : snmpd[1112]: %SNMP-SNMP-4-VIEWOID_NOT_FOUND : The command "snmp view li-view ciscoIpTapMIB included" could not be applied at this time because the oid "ciscoIpTapMIB" does not belong to a known MIB module.

  Conditions:

  SNMP bulk configuration, or load from saved configuration, or rollback (which include multiple SNMP commands) can cause the error messages.

  This behavior is observed since MIB is not loaded and the OID translation is not in place.

  After few seconds, this get resolved and you could query the MIB successfully.

  Workaround:

  None. When this behavior observed during SNMP configuration for lawful intercept; it still allowed adding taps and lawful intercept functionality did not impact in any manner.

  Recovery:

  None. These are harmless messages and does not impact any functionality

- **CSCtr78557**

  Basic Description:

  MPP SNMP out-of-band not working

  Symptom:

  1. snmp pkts coming on out-of-band interface got dropped.

2. when "snmp-server host trap source-port <port>" config was removed, snmp inform pkts were not received.

Conditions:

inform notification packets coming on MPP out-of-band interface.

Workaround:

snmpd process restart

- **CSCti50227**

 Basic Description:

 Not able to modify RPL and delete prefix-set in a single commit.

 Symptom:

 When a policy that is attached directly or indirectly to an attach point needs to be modified, a single commit operation cannot be performed when:

   – Removing a set or policy referred by another policy that is attached to any attach point directly or indirectly.

   – Modifying the policy to remove the reference to the same set or policy that is getting removed.

 Workaround:

 The commit must be performed in two steps:

 1. Modify the policy to remove the reference to the policy or set and then commit.

 2. Remove the policy or set and commit.

CRS Caveats from 4.1.1

- **CSCtq56162**

 Basic Description:

 Memory leak in mibd_interface on SNMP Polling of atmMIB.

 Symptom:

 An increase in memory consumption by mibd_interface process on an active RP occurs. It is approximately 16k mem leak for 500 polls.

 Conditions:

 This issue occurs with CRS running Cisco IOS XR 4.1.1.x image performing SNMP polling on ATMMIB.

 Workaround:

 None.

 Recovery:

 System can restart mibd_interface automatically, or user can initiate without any impact.

- **CSCtr16132**

 Basic Description:

 Multiple process crash while migrating from RP with os-mbi SMU .

 Symptom:

Multiple processes crash, and standby is stuck in MBI-running.

Conditions:

This issue can happen when a user is performing the following while migrating an RP-B:

1. Upgrading to a -px- image

AND

2. Applying -px- OS-MBI SMU

Workaround:

Do not include any os-mbi SMUs during the upgrade .

Recovery:

Remove the Standby RP card and re-insert the same.

Caveats Specific to the Cisco CRS-1 Router

The following open caveats are specific to the Cisco CRS-1 platform:

- **CSCtr23982**

  Basic Description:

  %L2-EGRESSQ-3-QUEUE_STUCK - LC reloaded

  Symptom:

  EgressQ Stuck condition is observed in CRS-edge profile system with the combination of edge feature set (l2vpn, mldp, l3vpn etc.) and IPv6 HBH options stream.

  Conditions:

  The issue is observed with overnight traffic. The issue is only applicable to CRS-MSC-40G or FP40 linecards .

  The issue is only observed in edge profile running IPv6 HBH options stream with many streams going over MTU limit.

  Workaround:

   N/A.

- **CSCtr76233**

  Basic Description:

  show controllers ingressq summary Spiller rev incorrect

  Symptom:

  The **admin show controllers ingressq summary** command displays an incorrect Spiller version

  Example of incorrect Spiller version being shown:

  ```
  RP/0/RP0/CPU0:router(admin)# show controllers ingressq summary

  ASIC State
  ----------
  Asic Type            Spiller rev 2 [NOT SUPPORTED]
  ```

  Conditions:

The EEPROM values have changed on the newer boards from "0300" to "0301". The version is determined from the EEPROM by checking if the offset 0x3E,0x3F are 0x03 and 0x00 respectively.

RPB with value 0301 will show the wrong Spiller 2 value.

Workaround:

Check for the Spiller version of the card with this command:

show diag 0/rp0/cpu0 eeprom-info | incl 30:

```
30:  00 1D 45 D1 AC 1E 00 1D 45 D1 AC 1F 00 00 03 01 <<<< Card does not have Spiller2
30:  00 1D 45 D1 AC 1E 00 1D 45 D1 AC 1F 00 00 03 00 <<<< Card does have Spiller2
```

Additional Information:

This is an enhancement DDTS to correct the incorrect display.

Caveats Specific to the Cisco CRS-3 Router

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

- **CSCto34421**

   Basic Description:

   EDM request Timeouts from online_diag_lc for Cisco CRS-3 LCs in steady state.

   Symptom:

   In Cisco IOS-XR, SYSDB-SYSDB-6-TIMEOUT_EDM syslog messages might be displayed steadily.

   Conditions:

   A syslog message like the following example might be displayed steadily:

   ```
   RP/0/RP0/CPU0:Mar 29 10:20:05.152 : sysdb_svr_admin[346]: %SYSDB-SYSDB-6-TIMEOUT_EDM :
   EDM request for 'admin/oper/fabric/rack/2/lport/s1tx/' from 'online_diag_lc' (jid 227,
   node 2/3/CPU0). No response from 'fsdb_server' (jid 211, node 2/RP1/CPU0) within the
   timeout period (100 seconds).
   ```

   It indicates that certain EDM requests are rejected by the sysdb. The reason is that the sysdb is not able to allocate memory for replies because of memory fragmentation. The probability of hitting this problem is low.

   Workaround:

   Not available.

   Recovery:

   Restart the sysdb_svr_admin process: **process restart sysdb_svr_admin**

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.