CHAPTER 1

Introduction to Cisco IOS XR Software

This chapter introduces the routers that support Cisco IOS XR software. It also introduces router concepts, features, and user interfaces.

Contents

Supported Standalone System Configurations

The Cisco IOS XR software runs on the following standalone systems:

- Cisco CRS 4-Slot Line Card Chassis (LCC)
- Cisco CRS 8-Slot LCC
- Cisco CRS 16-Slot LCC

The Cisco IOS XR software also runs on Cisco CRS Multishelf Systems, which are described in the "Cisco CRS Multishelf System Overview" section on page 1-1.

Cisco CRS Multishelf System Overview

The multishelf system enables multiple Cisco CRS LCCs to act as a single system. This release of the multishelf system supports the following options:

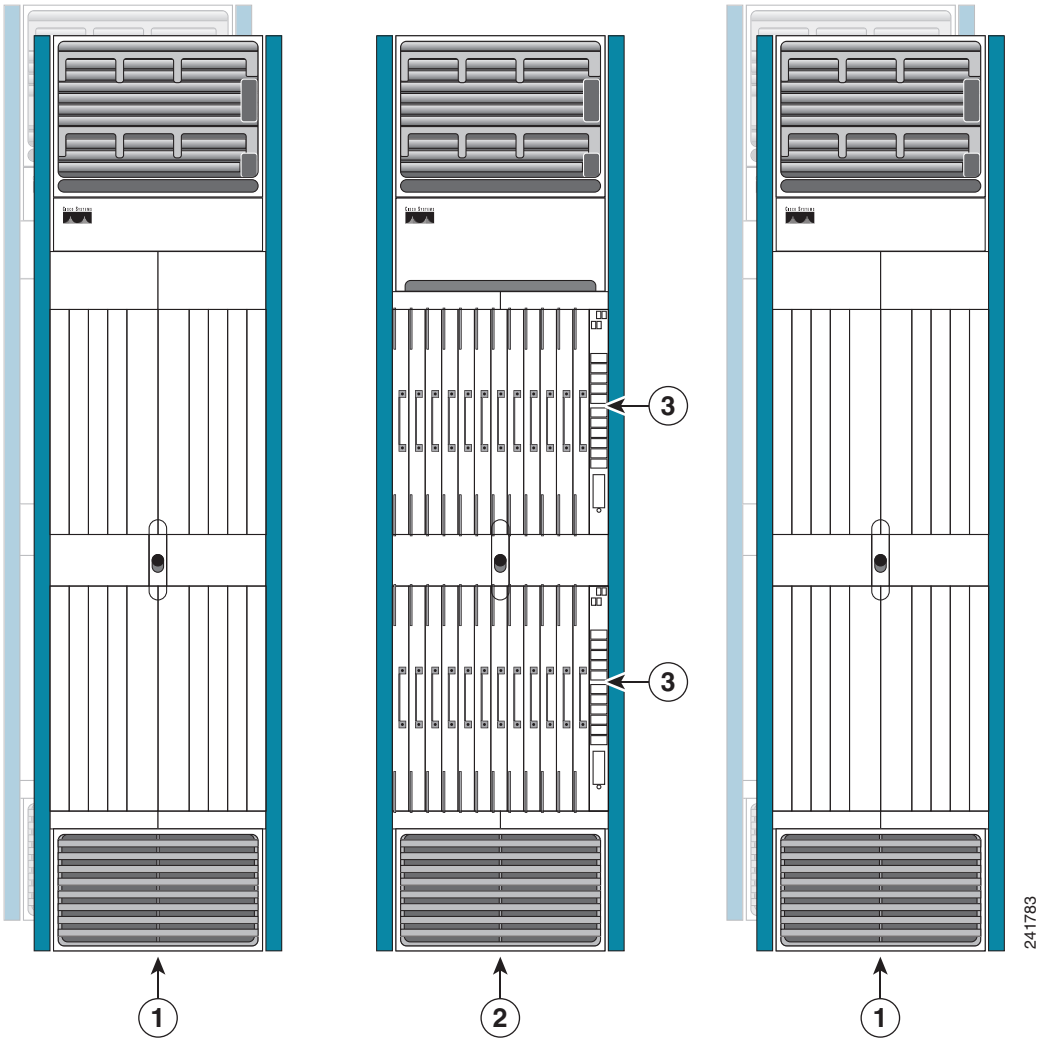
- Two 16-slot LCCs and one, two, or four fabric card chassis (FCCs) to provide a total switching capacity of up to 1.28 Terabits per second (Tbps).
- Three 16-slot LCCs with up to 64 modular services cards (MSCs), and one, two, or four FCCs.

- Four 16-slot LCCs with up to 64 MSCs and one, two, or four FCCs.
- Eight 16-slot LCCs with up to 128 MSCs and one, two, or four FCCs.

Two 22-port shelf controller Gigabit Ethernet (22-port SCGE) cards provide control-plane connectivity among the chassis.

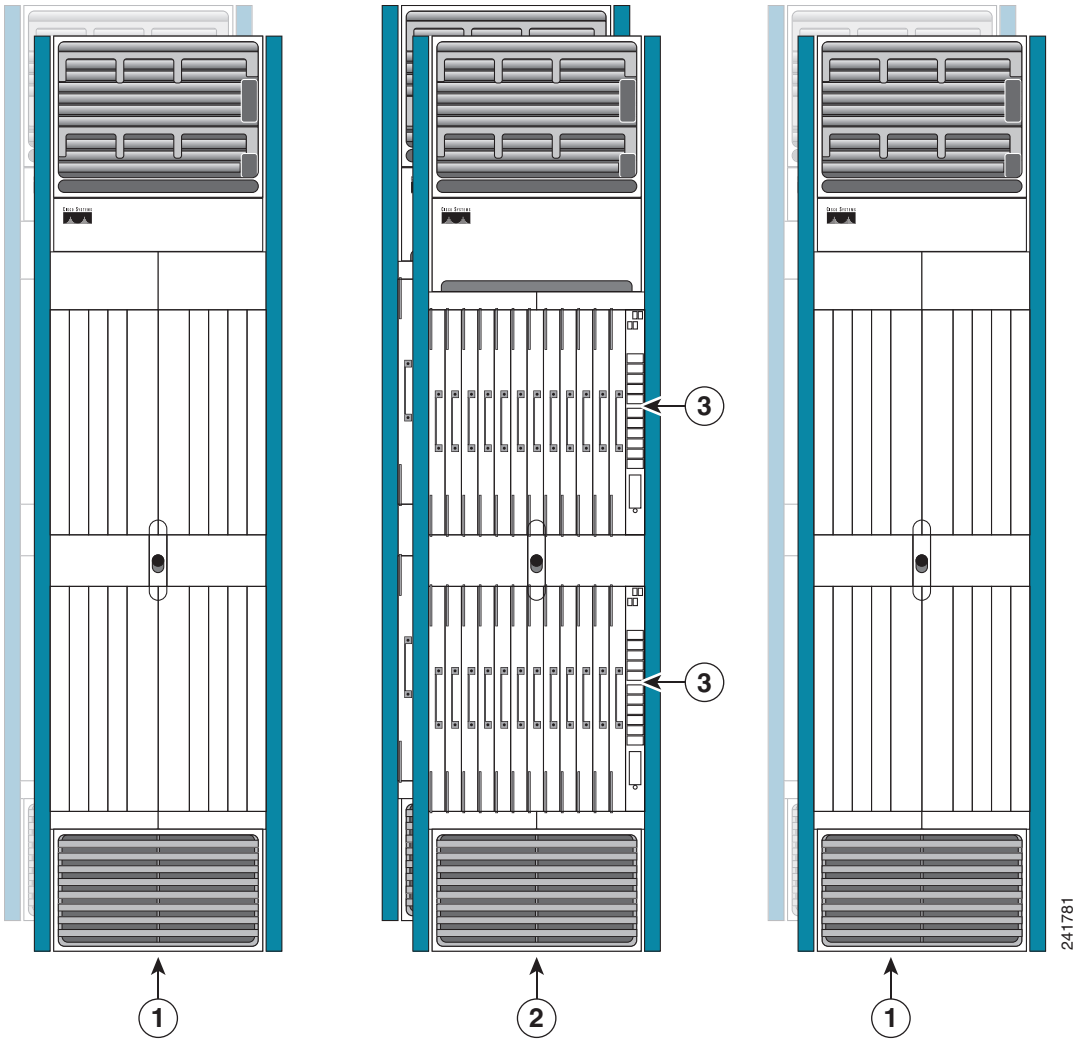
Figure 1-1 shows the single-FCC multishelf system, Figure 1-2 shows the two-FCC multishelf system, and Figure 1-3 shows the four-FCC multishelf system.

Figure 1-1 Single-FCC Multishelf System



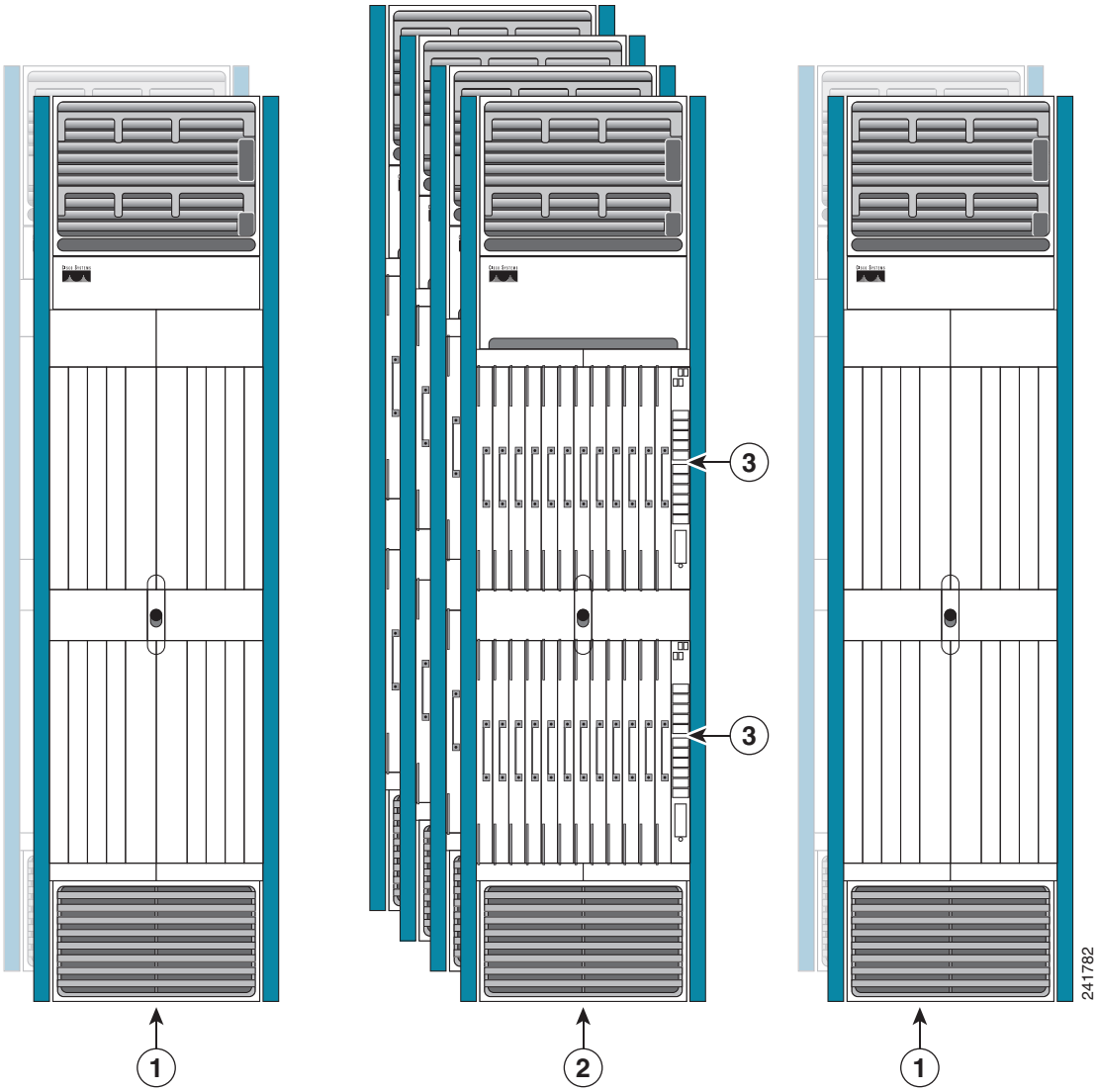
1	Cisco CRS 16-Slot Line Card Chassis (LCCs)
2	Cisco CRS Fabric Card Chassis (FCCs)
3	22-port SCGE card (two suggested for each FCC)

Figure 1-2 Two-FCC Multishelf System



1	Cisco CRS 16-Slot Line Card Chassis (LCCs)
2	Cisco CRS Fabric Card Chassis (FCCs)
3	22-port SCGE card (two suggested for each FCC)

Figure 1-3 Four-FCC Multishelf System



1	Cisco CRS 16-Slot Line Card Chassis (LCCs)
2	Cisco CRS Fabric Card Chassis (FCCs)
3	22-port SCGE card (two suggested for each FCC)

For more information on multishelf systems, see Chapter 3, "Bringing Up the Cisco IOS XR Software on a Multishelf System."

Cisco CRS Router Overview

The Cisco CRS Router is the first carrier router offering continuous system operation, unprecedented service flexibility, and system longevity. This router is powered by Cisco IOS XR software—a unique self-healing, distributed operating system designed for always-on operation while scaling system capacity up to 92 Tbps.

Features and Capabilities

The router is a scalable carrier-class distributed forwarding router, which is designed for redundancy, high security and availability, packaging, power, and other requirements needed by service providers.

The router aggregates triple play Multi-service edge and Ethernet service traffic aggregating these services to 10 Gigabit Ethernet IP, MPLS edge, or core. It support Ethernet, serial (including MLPPP), frame relay and POS interface on the access side and Ethernet or POS interfaces on the core side.

The following sections describe the features and capabilities in detail:

Cisco IOS XR Software

The router runs Cisco IOS XR Software, which offers the following:

- Rich Networking Feature Set—Cisco IOS XR Software represents a continuation of the Cisco networking leadership in helping customers realize the power of their networks and the Internet. It provides unprecedented routing-system scalability, high availability, service isolation, and manageability to meet the mission-critical requirements of next-generation networks.
- Operating system infrastructure protection—Cisco IOS XR Software provides a microkernel architecture that forces all but the most critical functions, such as memory management and thread distribution, outside of the kernel, thereby preventing failures in applications, file systems, and even device drivers from causing widespread service disruption.
- Process and thread protection—Each process, even individual process thread, is executed in its own protected memory space, and communications between processes are accomplished through well-defined, secure, and version-controlled application programming interfaces (APIs), significantly minimizing the effect that any process failure can have on other processes.
- Cisco In-Service Software Upgrade (ISSU)—Cisco IOS XR Software modularity sustains system availability during installation of a software upgrade. ISSUs or hitless software upgrades (HSUs) allow you to upgrade most Cisco router software features without affecting deployed services. You

can target particular system components for upgrades based on software packages or composites that group selected features. Cisco preconfigures and tests these packages and composites to help ensure system compatibility.

- Process restart—You can restart critical control-plane processes both manually and automatically in response to a process failure versus restarting the entire operating system. This feature supports the Cisco IOS XR Software goal of continuous system availability and allows for quick recovery from process or protocol failures with minimal disruption to customers or traffic.
- State checkpoint—You can maintain a memory and critical operating state across process restarts to sustain routing adjacencies and signaling state during a Route Switch Processor (RSP) switchover.
- Ethernet virtual connections (EVCs)—Ethernet services are supported using individual EVCs to carry traffic belonging to a specific service type or end user through the network. You can use EVC-based services in conjunction with MPLS-based L2VPNs and native IEEE bridging deployments.
- Flexible VLAN classification—VLAN classification into Ethernet flow points (EFPs) includes single-tagged VLANs, double-tagged VLANs (QinQ and IEEE 802.1ad), contiguous VLAN ranges, and noncontiguous VLAN lists.
- IEEE Bridging—Software supports native bridging based on IEEE 802.1Q, IEEE 802.1ad, IEEE 802.1ah provider backbone bridges (PBB) and QinQ VLAN encapsulation mechanisms on the router.
- IEEE 802.1s Multiple Spanning Tree (MST)—MST extends the IEEE 802.1w Rapid Spanning Tree Protocol (MSTP) to multiple spanning trees, providing rapid convergence and load balancing.
- MST Access Gateway—This feature provides a resilient, fast-convergence mechanism for aggregating and connecting to Ethernet-based access rings.
- Virtual Private LAN Services (VPLS)—VPLS is a class of VPN that supports the connection of multiple sites in a single, bridged domain over a managed IP/MPLS network. It presents an Ethernet interface to customers, simplifying the LAN and WAN boundary for service providers and customers, and enabling rapid and flexible service provisioning because the service bandwidth is not tied to the physical interface. All services in a VPLS appear to be on the same LAN, regardless of location.
- Hierarchical VPLS (H-VPLS)—H-VPLS provides a level of hierarchy at the edge of the VPLS network for increased scale. QinQ access and H-VPLS pseudowire access options are supported.
- Virtual Private WAN Services/Ethernet over MPLS (VPWS/EoMPLS)—EoMPLS transports Ethernet frames across an MPLS core using pseudowires. Individual EFPs or an entire port can be transported over the MPLS backbone using pseudowires to an egress interface or subinterface.
- Pseudowire redundancy—Pseudowire redundancy supports the definition of a backup pseudowire to protect a primary pseudowire that fails.
- Multisegment pseudowire stitching—Multisegment pseudowire stitching is a method for interworking two pseudowires together to form a cross-connect relationship.
- IPv4 Multicast—IPv4 Multicast supports Internet Group Management Protocol Versions 2 and 3 (IGMPv2/v3), Protocol Independent Multicast Source Specific Multicast (SSM) and Sparse Mode (SM), Multicast Source Discovery Protocol (MSDP), and Anycast Rendezvous Point (RP).
- IGMP v2/v3 Snooping—This Layer 2 mechanism efficiently tracks multicast membership on an L2VPN network. Individual IGMP joins are snooped at the VLAN level or pseudowire level, and then it summarizes the results into a single upstream join message. In residential broadband deployments, this feature enables the network to send only channels that are being watched to the downstream users.

- Bidirectional Forwarding Detection (BFD)—This protocol has been enhanced to detect connectivity failures over bundle interfaces, which are directly connected between two routers. A benefit of this feature is that problems, such as, link loss or link down, are absorbed by the link aggregation infrastructure. For more information on BFD, see *Cisco IOS XR Interface and Hardware Component Configuration Guide for the Cisco CRS Router.*

Flexible Ethernet

The router uses Ethernet as its transport mechanism, which offers the following:

- Ethernet virtual connections (EVCs)—Ethernet services are supported using individual EVCs to carry traffic belonging to a specific service type or end user through the network. You can use EVC-based services in conjunction with MPLS-based L2VPNs and native IEEE bridging deployments.
- Flexible VLAN classification—VLAN classification into EFPs includes single-tagged VLANs, double-tagged VLANs (QinQ and IEEE 802.1ad), contiguous VLAN ranges, and noncontiguous VLAN lists.
- IEEE Bridging— The software supports native bridging based on IEEE 802.1Q, IEEE 802.1ad, and QinQ VLAN encapsulation mechanisms on the router.
- IEEE 802.1s Multiple Spanning Tree (MST)—MST extends the MSTP to multiple spanning trees, providing rapid convergence and load balancing.
- MST Access Gateway—This feature provides a resilient, fast-convergence mechanism for aggregating and connecting to Ethernet-based access rings.

L2VPN

The router uses L2VPNs, which offers the following:

- Virtual Private LAN Services (VPLS)—VPLS is a class of VPN that supports the connection of multiple sites in a single, bridged domain over a managed IP/MPLS network. It presents an Ethernet interface to customers, simplifying the LAN and WAN boundary for service providers and customers, and enabling rapid and flexible service provisioning because the service bandwidth is not tied to the physical interface. All services in a VPLS appear to be on the same LAN, regardless of location.

  VPLS-specific match criteria, such as match on VPLS-known, match on VPLS-unknown, match on multicast, and match on VPLS-broadcast, are supported.
- VPLS MAC Address Withdrawal—For faster VPLS convergence, it is essential to unlearn MAC addresses that have been learned dynamically. This is accomplished by sending an LDP Address Withdraw Message, with the list of MAC addresses to be withdrawn, to all PEs participating in the corresponding VPLS service. Cisco IOS XR supports only wild-card MAC address withdrawal.
- Hierarchical VPLS (H-VPLS)—H-VPLS provides a level of hierarchy at the edge of the VPLS network for increased scale. QinQ access and H-VPLS pseudowire access options are supported.
- Virtual Private WAN Services/Ethernet over MPLS (VPWS/EoMPLS)—EoMPLS transports Ethernet frames across an MPLS core using pseudowires. Individual EFPs or an entire port can be transported over the MPLS backbone using pseudowires to an egress interface or subinterface.
- Pseudowire redundancy—Pseudowire redundancy supports the definition of a backup pseudowire to protect a primary pseudowire that fails.
- Multisegment pseudowire stitching—Multisegment pseudowire stitching is a method for interworking two pseudowires together to form a cross-connect relationship.

Multicast

The router supports multicast, which offers the following:

- IPv4 Multicast—IPv4 Multicast supports Internet Group Management Protocol Versions 2 and 3 (IGMPv2/v3), Protocol Independent Multicast Source Specific Multicast (SSM) and Sparse Mode (SM), Multicast Source Discovery Protocol (MSDP), and Anycast Rendezvous Point (RP).
- IGMP v2/v3 Snooping—This Layer 2 mechanism efficiently tracks multicast membership on an L2VPN network. Individual IGMP joins are snooped at the VLAN level or pseudowire level, and then it summarizes the results into a single upstream join message. In residential broadband deployments, this feature enables the network to send only channels that are being watched to the downstream users.
- Multicast VPN Auto RP Lite—This feature automates the distribution of group-to-RP mappings in a PIM network. This feature has the following benefits:
  - Uses multiple RPs within a network to serve different group ranges.
  - Allows load splitting among different RPs and arrangement of RPs according to the location of group participants.
  - Avoids inconsistent, manual RP configurations that can cause connectivity problems.
- Multicast VPN Extranet Support—This feature enables service providers to distribute IP multicast content originated from one enterprise site to other enterprise sites. This feature enables service providers to offer the next generation of flexible extranet services, helping to enable business partnerships between different enterprise VPN customers.
- Multicast VPN Hub and Spoke Support—This feature provides a granular control on the multicast traffic flows through all sites. In this topology, a spoke VRF contains the routes of its own site and the routes of the hub sites. It does not contain the routes of other spokes. Hubs contain the routes of spokes as well as to other hubs. Hub-to-hub connectivity is any-to-any topology.

OAM

The router supports different types of operations, administration, and maintenance (OAM), which offers the following:

- E-OAM (IEEE 802.3ah)—Ethernet link layer OAM is a vital component of EOAM that provides physical-link OAM to monitor link health and assist in fault isolation. Along with IEEE 802.1ag, Ethernet link layer OAM can be used to assist in rapid link-failure detection and signaling to remote end nodes of a local failure.
- E-OAM (IEEE 802.1ag)—Ethernet Connectivity Fault Management is a subset of EOAM that provides numerous mechanisms and procedures that allow discovery and verification of the path through IEEE 802.1 bridges and LANs.
- MPLS OAM—This protocol supports label-switched-path (LSP) ping, LSP TraceRoute, and virtual circuit connectivity verification (VCCV). This protocol also supports P2MP LSP ping and P2MP LSP Trace Route.

Layer 3 routing

The router runs Cisco IOS XR Software, which supports Layer 3 routing and a range of IPv4 services and routing protocols, including the following:

- Intermediate System-to-Intermediate System (IS-IS)—Integrated Intermediate IS-IS, Internet Protocol Version 4 (IPv4), is a standards-based Interior Gateway Protocol (IGP). For more information on IS-IS, see *Cisco IOS XR Routing Configuration Guide for the Cisco CRS Router.*
- Open Shortest Path First (OSPF)—OSPF is an IGP developed by the OSPF working group of the Internet Engineering Task Force (IETF). For more information on OSPF, see *Cisco IOS XR Routing Configuration Guide for the Cisco CRS Router.*
- Static Routing—Static routes are user-defined routes that cause packets moving between a source and a destination to take a specified path. For more information on static routing, see *Cisco IOS XR Routing Configuration Guide for the Cisco CRS Router.*
- IPv4 Multicast—IPv4 Multicast delivers source traffic to multiple receivers without adding any additional burden on the source or the receivers while using the least network bandwidth of any competing technology. For more information on IPv4 Multicast, see *Cisco IOS XR Multicast Configuration Guide for the Cisco CRS Router.*
- Routing Policy Language (RPL)—RPL provides a single, straightforward language in which all routing policy needs can be expressed. For more information on RPL, see *Cisco IOS XR Routing Configuration Guide for the Cisco CRS Router.*
- Hot Standby Router Protocol (HSRP)—HSRP is an IP routing redundancy protocol designed to allow for transparent failover at the first-hop IP router. For more information on HSRP, see *Cisco IOS XR IP Addresses and Services Configuration Guide for the Cisco CRS Router.*
- Virtual Router Redundancy Protocol (VRRP)—VRRP allows for transparent failover at the first-hop IP router, enabling a group of routers to form a single virtual router. For more information on VRRP, see *Cisco IOS XR IP Addresses and Services Configuration Guide for the Cisco CRS Router.*
- Border Gateway Protocol (BGP) Add Path— This feature enables a BGP speaker to send multiple paths for a prefix. For more information on BGP Add Path, see *Cisco IOS XR Routing Configuration Guide for the Cisco CRS Router.*
- ACL Based Forwarding (ABF)—ABF lets you specify the next-hop address in ACL configuration. Instead of routing packets based on destination address lookup, the next-hop address specified in ACL configuration is used to forward packets towards the destination. For more information on ABF, see *Cisco IOS XR IP Addresses and Services Configuration Guide for the Cisco CRS Router.*

MPLS VPN

The router supports MPLS VPN, which offers the following:

- MPLS L3VPN—This IP VPN feature for MPLS allows a Cisco IOS Software or Cisco IOS XR software network to deploy scalable IPv4 Layer 3 VPN backbone services. An IP VPN is the foundation that companies use for deploying or administering value-added services, including applications and data hosting network commerce and telephony services, to business customers.
- Carrier Supporting Carrier (CSC)—CSC allows an MPLS VPN service provider to connect geographically isolated sites using another backbone service provider and still maintain a private address space for its customer VPNs. It is implemented as defined by IETF RFC 4364.

- Inter-AS—is a peer-to-peer type model that allows extension of VPNs through multiple provider or multi-domain networks. This lets service providers peer up with one another to offer end-to-end VPN connectivity over extended geographical locations. An MPLS VPN Inter-AS allows:
  - VPN to cross more than one service provider backbone.
  - VPN to exist in different areas.
  - confederations to optimize Internal Border Gateway Protocol (iBGP) meshing.

QoS

The router supports many types of quality of service (QoS), which offers the following:

- QoS—Comprehensive QoS support with up to 3 million queues, Class-Based Weighted Fair Queuing (CBWFQ) based on a three-parameter scheduler, Weighted Random Early Detection (WRED), two-level strict priority scheduling with priority propagation, and 2-rate, 3-color (2R3C) Policing are all supported.

  Match on inner VLAN and match on inner cos are supported for both ingress and egress. Set inner cos for both conditional and unconditional marking only in egress are supported.
- Cisco IOS XR Software—This software supports a rich variety of QoS mechanisms, including policing, marking, queuing, dropping, and shaping. In addition, the operating systems support Modular QoS CLI (MQC). Modular CLI is used to configure various QoS features on various Cisco platforms.
- H-QoS—Is supported on Ethernet interfaces. For EVCs four-level H-QoS support is provided with the following hierarchy levels: port, group of EFPs, EFP, and class of service. This level of support allows for per-service and per-end user QoS granularity. Four-level H-QoS support is provided for EVCs with the following hierarchy levels: port, group of EFPs, EFP, and class of service. This level of support allows for per-service and per-end user QoS granularity. H-QOS support is also provided on SIP based interfaces.

MPLS TE

The router supports MPLE Traffic Engineering (TE), which offers the following:

- MPLS TE—Cisco IOS XR Software supports MPLS protocols such as Traffic Engineering/Fast Reroute (TE-FRR), Resource Reservation Protocol (RSVP), Label Distribution Protocol (LDP), and Targeted Label Distribution Protocol (T-LDP).
- MPLS TE Preferred Path—Preferred tunnel path functions let you map pseudowires to specific TE tunnels. Attachment circuits are cross-connected to specific MPLS TE tunnel interfaces instead of remote provider-edge router IP addresses (reachable using IGP or LDP).
- AutoTunnel Backup—This feature enables a router to dynamically build backup tunnels when they are needed. It eliminates the need for users to pre-configure each backup tunnel and then assign the backup tunnel to the protected interface.
- Shared Risk Link Group (SRLG)—A Shared Risk Link Group (SRLG) is a group of network links that share a common physical resource (cable, conduit, node or substructure). An SRLG is identified by a 32-bit number that is unique within an IGP domain. The head end router broadcasts its SRLG and uses it to compute paths.

Hardware Feature

- Multi-rate Copper SFP—This feature adds the speed parameter to the CLI for pluggable copper SFPs. In the Gigabit Ethernet interface configuration, the speed can be configured as:
  - Speed {10 | 100 | 1000} (in megabits per second)
  - No speed (defaults to 1000)

Router Management Interfaces

Because new routers are not yet configured for your environment, you must begin the configuration using the command-line interface (CLI). This guide provides instructions on using the CLI to configure basic router features. Cisco IOS XR software supports the following router management interfaces, which are described in the following sections:

- Command-Line Interface, page 1-11
- Extensible Markup Language API, page 1-11
- Simple Network Management Protocol, page 1-12

Command-Line Interface

The CLI is the primary user interface for configuring, monitoring, and maintaining routers that run Cisco IOS XR software. The CLI allows you to directly and simply execute Cisco IOS XR commands.

All procedures in this guide use CLI. Before you can use other router management interfaces, you must first use the CLI to install and configure those interfaces. Guidelines for using the CLI to configure the router are discussed in the following chapters:

- Configuring General Router Features
- Configuring Additional Router Features
- CLI Tips, Techniques, and Shortcuts

For more information on CLI procedures for other tasks, such as hardware interface and software protocol management tasks, see the Cisco IOS XR software documents listed in the "Related Documents" section on page x.

Extensible Markup Language API

The Extensible Markup Language (XML) application programming interface (API) is an XML interface used for rapid development of client applications and perl scripts to manage and monitor the router. Client applications can be used to configure the router or request status information from the router by encoding a request in XML API tags and sending it to the router. The router processes the request and sends the response to the client in the form of encoded XML API tags. The XML API supports readily available transport layers, including Telnet, SSH, and Common Object Request Broker Architecture (CORBA). The Secure Socket Layer (SSL) transport is also supported by the XML API.

For more information, see the Cisco IOS XR software documents listed in the "Related Documents" section on page x.

Simple Network Management Protocol

Simple Network Management Protocol (SNMP) is an application-layer protocol that facilitates the exchange of management information between network devices. By using SNMP-transported data (such as packets per second and network error rates), network administrators can manage network performance, find and solve network problems, and plan for network growth.

The Cisco IOS XR software supports SNMP v1, v2c, and v3. SNMP is part of a larger architecture called the Internet Network Management Framework (NMF), which is defined in Internet documents called RFCs. The SNMPv1 NMF is defined by RFCs 1155, 1157, and 1212, and the SNMPv2 NMF is defined by RFCs 1441 through 1452.

SNMP is a popular protocol for managing diverse commercial internetworks and those used in universities and research organizations. SNMP-related standardization activity continues even as vendors develop and release state-of-the-art, SNMP-based management applications. SNMP is a relatively simple protocol, yet its feature set is sufficiently powerful to handle the difficult problems presented in trying to manage the heterogeneous networks of today.

For more information, see the Cisco IOS XR software documents listed in the "Related Documents" section on page x.

Selecting and Identifying the Designated Shelf Controller

The designated shelf controller (DSC) controls a standalone router or a multishelf system. A DSC is a role that is assigned to one route processor (RP) card in each router or multishelf system. RP cards operate in Cisco CRS routers.

Note Throughout this guide, the term RP is used to refer to the RP cards supported on Cisco CRS routers. If a feature or an issue applies to only one platform, the accompanying text specifies the platform.

Although each router or multishelf system can have two RP cards, only one can serve as the DSC and control the router or multishelf system. The DSC provides system-wide administrative functions, including:

- User configuration using a terminal connection or network connection
- Distribution of software to each node in the router or system
- Coordination of software versioning and configurations for all nodes in the router or system
- Hardware inventory and environmental monitoring

The first step in setting up a new router is to select or identify the DSC because the initial router configuration takes place through the DSC. The following sections describe how to select and identify the DSC on different routers and the multishelf system:

- Selecting and Identifying the DSC on Individual Cisco CRS Routers, page 1-13
- Selecting and Identifying the DSC on Cisco CRS Multishelf Systems, page 1-13
- Verifying the DSC, page 1-13

Selecting and Identifying the DSC on Individual Cisco CRS Routers

A Cisco CRS router supports up to two RPs. If only one RP is installed, that RP automatically becomes the DSC. If two RPs are installed, the default configuration selects RP0 as the DSC. To select RP1 to become the DSC for a new installation, install RP1 first, apply power to the system, and wait for RP1 to start up. When the Primary LED on the RP1 front panel lights, RP1 is operating as the DSC, and you can install RP0.

The active RP and DSC lights the primary LED on the RP front panel. The alphanumeric LED display on the active RP displays ACTV RP. By default, the other RP becomes the standby RP, displays STBY RP on the alphanumeric display, and takes over if the DSC fails.

To visually determine which RP is operating as the DSC in a Cisco CRS router, look for the RP on which the primary LED is lit. You can also look for the RP that displays the ACTV RP message on the alphanumeric display.

Selecting and Identifying the DSC on Cisco CRS Multishelf Systems

A Cisco CRS Multishelf System supports up to two RPs in each LCC. Each LCC must have at least one RP, so a multishelf system supports between two and eight RPs. The RPs in a multishelf system operate much like the RPs in a standalone router. The difference is that only one LCC can host the DSC.

During the initial startup of a multishelf system, the DSC is RP0 in the LCC with the lowest configured rack number, which is usually Rack 0. To select RP1 within Rack 0 to become the DSC, install RP1 first, and wait for RP1 to start up. When the Primary LED on the RP1 front panel lights (or the alphanumeric display shows ACTV RP), RP1 is operating as the DSC, and you can install RP0. If you are setting up a new multishelf system, the instructions in Chapter 3, “Bringing Up the Cisco IOS XR Software on a Multishelf System,” specify the appropriate time to bring up and configure the DSC.

The active RP and DSC lights the Primary LED on the RP front panel. The alphanumeric LED display on the active RP displays ACTV RP. By default, the other RP becomes the standby RP, displays STBY RP on the alphanumeric display, and takes over if the DSC RP fails.

After the DSC starts up in Rack 0, the DSC remains in Rack 0 while at least one RP in Rack 0 is operating properly. If both RPs in Rack 0 fail, the active RP in the other rack becomes the DSC. The process of moving the DSC function from one rack to another is called DSC migration. For more information on DSC migration, see *Cisco IOS XR System Management Configuration Guide for the Cisco CRS Router.*

Note Any LCC can host the DSC. The FCC cannot host the DSC function.

Verifying the DSC

Use the **show dsc** command to verify which RP is acting as the primary DSC for the router or routing system. The following example shows sample output of the **show dsc** command on a Cisco CRS router:

```
RP/0/RP0/CPU0:router#admin
Mon May 31 01:58:45.013 DST
RP/0/RP0/CPU0:router(admin)#show dsc all
Mon May 31 01:58:49.010 DST

NODE            ROLE        PRIORITY      TBEACON   PRESENT  SERIAL ID
================================================================================
0/RP0/CPU0      DSC         DEFAULT       300       YES      TBA09370035
--------------------------------------------------------------------------------
```

```
0/RP1/CPU0      BACKUP      DEFAULT       300       YES      TBA09370035
------------------------------------------------------------------------------
0/4/CPU0        NON-DSC     65            300       YES      TBA09370035
------------------------------------------------------------------------------
0/4/CPU1        NON-DSC     66            300       YES      TBA09370035
------------------------------------------------------------------------------
```

Connecting to the Router Through the Console Port

The first time you connect to a new router with Cisco IOS XR software, you must connect through the Console port on the DSC. Although typical router configuration and management take place using an Ethernet port on the DSC, you must configure the console port for your LAN before it can be used.

Figure 1-4 shows the RP connections on the Cisco CRS 16-Slot LCC, and Figure 1-5 shows the RP connections on the Cisco CRS 4-Slot LCC and Cisco CRS 8-Slot LCC.

Figure 1-4 Communication Ports on the RP for a Cisco CRS 16-Slot LCC

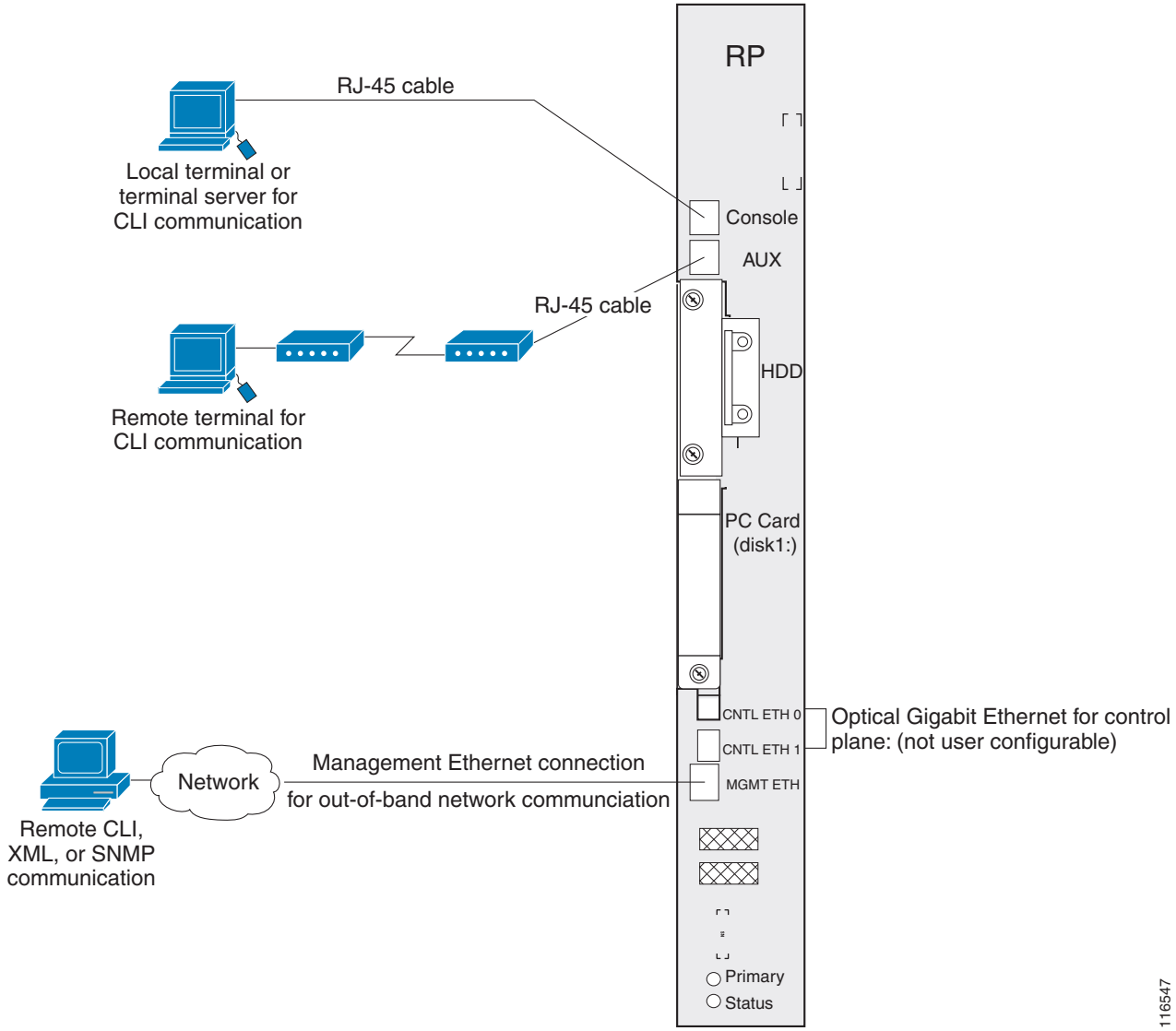
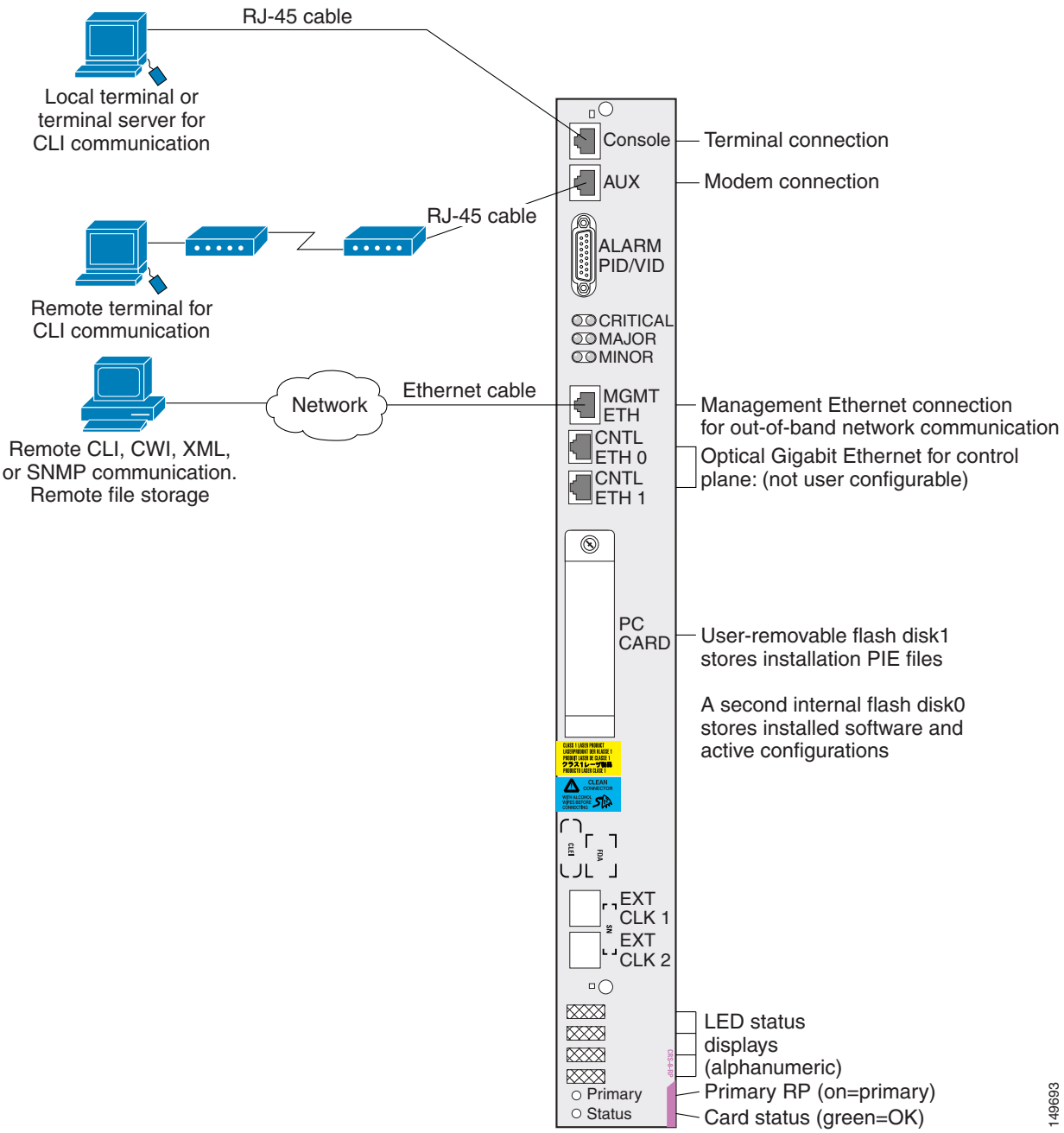


Figure 1-5 Communication Ports on the RP for Cisco CRS 4-slot and 8-Slot LCCs



To connect to the router through the Console port, perform the following procedure.

SUMMARY STEPS

1. Power on the standalone router, or power on Rack 0 in a multishelf system.
2. Identify the DSC.
3. Connect a terminal to the Console port of the DSC.
4. Start the terminal emulation program.
5. Press **Enter**.
6. Log in to the router.
7. **admin**
8. **show dsc all**

DETAILED STEPS

	Command or Action	Purpose
Step 1	Power on the standalone router, or power on Rack 0 in a multishelf system.	Starts the router or Rack 0. • This step is required only if the power is not on. • For information on power installation and controls, see the hardware documentation listed in the "Related Documents" section on page x.
Step 2	Identify the DSC.	Identifies the RP to which you must connect in the next step. • For more information, see the "Selecting and Identifying the Designated Shelf Controller" section on page 1-12.
Step 3	Connect a terminal to the Console port of the DSC.	Establishes a communications path to the router. • During the initial setup, you can communicate with the router only through the Console port of the DSC. • Router Console port is designed for a serial cable connection to a terminal or a computer that is running a terminal emulation program. • Terminal settings are: – Bits per second: 9600/9600 – Data bits: 8 – Parity: None – Stop bit: 2 – Flow control: None • For information on the cable requirements for the Console port, see the hardware documentation listed in the "Related Documents" section on page x.

	Command or Action	Purpose
Step 4	Start the terminal emulation program.	(Optional) Prepares a computer for router communications. • Not required if you are connecting through a terminal. • Terminals send keystrokes to, and receive characters, from another device. If you connect a computer to the Console port, you must use a terminal emulation program to communicate with the router. For instructions on using the terminal emulation program, see the documentation for that program.
Step 5	Press **Enter**.	Initiates communication with the router. • If no text or router prompt appears when you connect to the console port, press **Enter** to initiate communications. • If no text appears when you press **Enter**, give the router more time to complete the initial boot procedure, then press **Enter**. • If the prompt gets lost among display messages, press **Enter** again. • If the router has no configuration, the router displays the prompt: `Enter root-system username:` • If the router has been configured, the router displays the prompt: `Username:`
Step 6	Log in to the router.	Establishes your access rights for the router management session. • Enter the root-system username and password or the username and password provided by your system administrator. • After you log in, the router displays the CLI prompt, which is described in the "CLI Prompt" section on page 4-83. • If the router prompts you to enter a root-system username, the router is not configured, and you should follow one of the bring up procedures mentioned in the next section.
Step 7	**admin** **Example:** `RP/0/RP0/CPU0:router# admin`	Places the router in administration EXEC mode.
Step 8	**show dsc all** **Example:** `RP/0/RP0/CPU0:router(admin)# show dsc all`	Displays the DSC information for the router or router system so that you can verify that you have connected to the DSC console port.

Where to Go Next

If you have logged into the router or multishelf system, you can perform the general router configuration as described in Configuring General Router Features.

If the router is prompting you to enter a root-system username, bring up the router. For more information, see Chapter 2, "Bringing Up the Cisco IOS XR Software on a Standalone Router".

If the router is prompting you to enter a root-system username, bring up the multishelf system. For more information, see Chapter 3, "Bringing Up the Cisco IOS XR Software on a Multishelf System".