

Steelhead® Appliance Installation and Configuration Guide

Steelhead® CX (xx55)
Steelhead® (xx50)

Version 8.6

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Preface

Welcome to the *Steelhead Appliance Installation and Configuration Guide* (Steelhead appliance, Steelhead CX appliance). Read this preface for an overview of the information provided in this guide and for an understanding of the documentation conventions used throughout. This preface includes the following sections:

- [“About This Guide” on page 1](#)
- [“Product Dependencies and Compatibility” on page 2](#)
- [“Additional Resources” on page 5](#)
- [“Safety Guidelines” on page 6](#)
- [“Contacting Riverbed” on page 6](#)

About This Guide

The *Steelhead Appliance Installation and Configuration Guide* describes how to install and configure the Steelhead appliance. It also describes the status lights and specifications for the system.

Audience

This guide is written for storage and network administrators familiar with administering and managing WANs using common network protocols such as TCP, CIFS, HTTP, FTP, and NFS.

Document Conventions

This manual uses the following standard set of typographical conventions to introduce new terms, illustrate screen displays, describe command syntax, and so forth.

Convention	Meaning
<i>italics</i>	Within text, new terms, emphasized words, and REST API URIs appear in <i>italic</i> typeface.
boldface	Within text, CLI commands, CLI parameters, and REST API properties appear in bold typeface.
Courier	Code examples appears in Courier font: <pre>amnesiac > enable amnesiac # configure terminal</pre>
< >	Values that you specify appear in angle brackets: interface <ipaddress>
[]	Optional keywords or variables appear in brackets: ntp peer <addr> [version <number>]
{ }	Required keywords or variables appear in braces: { delete <filename>}
	The pipe symbol represents a choice to select one keyword or variable to the left or right of the symbol. The keyword or variable can be either optional or required: { delete <filename> upload <filename>}

Product Dependencies and Compatibility

This section provides information about product dependencies and compatibility. It includes the following information:

- [“Hardware and Software Dependencies” on page 3](#)
- [“CMC Compatibility” on page 3](#)
- [“Virtual Services Platform \(VSP\) Support” on page 4](#)
- [“Ethernet Network Compatibility” on page 4](#)
- [“SNMP-Based Management Compatibility” on page 5](#)

Hardware and Software Dependencies

The following table summarizes the hardware and software requirements for the Steelhead appliance.

Riverbed Component	Hardware and Software Requirements
Steelhead Appliance	19-inch (483 mm) two or four-post rack.
Steelhead Management Console	<p>Any computer that supports a Web browser with a color image display.</p> <p>The Management Console has been tested with Mozilla Firefox Extended Support Release version 24.0 and Microsoft Internet Explorer v8.0 and v9.0.</p> <p>The Central Management Console has been tested with Mozilla Firefox Extended Support Release version 24.0, and Microsoft Internet Explorer v8.0 and v9.0.</p> <p>JavaScript and cookies must be enabled in your Web browser.</p> <p>Internet Explorer v8.0 and v9.0 must refresh reports every 4 minutes due to performance issues. Consider using a different browser to view reports.</p>

CMC Compatibility

The Steelhead appliance has been tested with the following Central Management Console (CMC) versions:

Steelhead Appliance RiOS Version	Recommended Version	CMC Appliance v8.5.x	CMC Appliance v8.0.x	CMC Appliance v7.0.x	CMC Appliance v6.5.x
Steelhead appliance v8.6	CMC appliance v8.6	Parity	Not supported	Not supported	Not supported
Steelhead CX appliance v8.6					
Steelhead EX appliance v3.5					
Steelhead appliance v8.5.x	CMC appliance v8.5.x	Parity	Not supported	Not supported	Not supported
Steelhead CX appliance v8.5.x					
Steelhead EX appliance v2.5.x					
Steelhead appliance v8.0.x	CMC appliance v8.5.x; Edge High	Parity	Parity	Not supported	Not supported
Steelhead CX appliance v8.0.x	Availability only for Steelhead EX appliance v2.0 or later				
Steelhead EX appliance v2.1.x					
Steelhead EX appliance v2.0.x					

Steelhead Appliance RiOS Version	Recommended Version	CMC Appliance v8.5.x	CMC Appliance v8.0.x	CMC Appliance v7.0.x	CMC Appliance v6.5.x
Steelhead appliance v7.0.x Steelhead CX appliance v7.0.x Steelhead EX appliance v1.0.x	CMC appliance v8.5.x; no Edge High Availability	Parity	Parity	Partial	Partial support with CMC appliance v6.5.3
Steelhead appliance v6.5.x	CMC appliance v8.5.x or CMC appliance v6.5.3*; Steelhead appliance v6.5.1 and later QoS configuration support only	Parity	Parity	Parity	Parity
Steelhead appliance v6.1.x Steelhead appliance v6.0.x Steelhead appliance v5.5.x (v5.5.4 and later)	CMC appliance v8.0.x or CMC appliance v6.5.3*	Monitor only with Steelhead appliance v6.0.0; CMC appliance v6.0.1 unsupported	Parity	Parity	Parity

Virtual Services Platform (VSP) Support

VSP is not supported on the Series xx55 hardware platforms. VSP is supported only on the EX Series xx60 hardware platforms. For detailed information about the Steelhead EX systems, see the *Steelhead EX Installation and Configuration Guide*.

Firewall Requirements

Riverbed recommends that you deploy the Steelhead appliance behind your firewall. The following firewall settings are required for the Steelhead appliance:

- Ports 7800 and 7810 must be open.
- Make sure your firewall does not strip TCP options.

Ethernet Network Compatibility

The Steelhead appliance supports the following Ethernet networking standards:

- Ethernet Logical Link Control (LLC) (IEEE 802.2 - 1998)
- Fast Ethernet 100 Base-TX (IEEE 802.3 - 2008)
- Gigabit Ethernet over Copper 1000 Base-T and Fiber 1000 Base-SX (LC connector) and Fiber 1000 Base LX (IEEE 802.3 - 2008)
- 10 Gigabit Ethernet over Fiber 10GBase-LR Single Mode and 10GBase-SR Multimode (IEEE 802.3 - 2008)

The Steelhead appliance ports support the following connection types and speeds:

- **Primary** - 10/100/1000 Base-T, auto-negotiating
- **Auxiliary** - 10/100/1000 Base-T, auto-negotiating
- **LAN** - 10/100/1000 Base-TX or 1000 Base-SX or 1000 Base-LX or 10GBase-LR or 10GBase-SR, depending on configuration
- **WAN** - 10/100/1000 Base-TX or 1000 Base-SX or 1000 Base-LX or 10GBase-LR or 10GBase-SR, depending on configuration

1000 Base-SX and 1000 Base-LX interface options are not available for the Steelhead appliance 150, 250, and 550 models.

The Steelhead appliance supports VLAN Tagging (IEEE 802.3 - 2008). It does not support the ISL protocol.

All copper interfaces are auto-sensing for speed and duplex (IEEE 802.3 - 2008).

The Steelhead appliance auto-negotiates speed and duplex mode for all data rates and supports full duplex mode and flow control (IEEE 802.3 - 2008).

The Steelhead appliance with a Gigabit Ethernet card supports jumbo frames on in-path and primary ports.

SNMP-Based Management Compatibility

The Steelhead appliance supports a proprietary Riverbed MIB accessible through SNMP. SNMP v1 (RFCs 1155, 1157, 1212, and 1215) and SNMP v2c (RFCs 1901, 2578, 2579, 2580, 3416, 3417, and 3418) are supported, even though some MIB items can only be accessible through SNMPv2.

SNMP support allows the Steelhead appliance to be integrated into network management systems such as Hewlett Packard OpenView Network Node Manager, BMC Patrol, and other SNMP-based network management tools.

Additional Resources

This section describes resources that supplement the information in this guide. It contains the following sections:

- [“Release Notes” on page 5](#)
- [“Riverbed Documentation and the Support Knowledge Base” on page 6](#)

Release Notes

The online software release notes supplement the information in this manual. The release notes are available in the Software section of the Riverbed Support site at <https://support.riverbed.com>. The following table describes the release notes.

Online File Format	Purpose
<product>_<version_number> <build_number>.pdf	Describes the product release and identifies fixed problems, known problems, and work-arounds. This file also provides documentation information not covered in the guides or that has been modified since publication.

Examine the online release notes before you begin the installation and configuration process. They contain important information about this release of the Steelhead appliance.

Riverbed Documentation and the Support Knowledge Base

For a complete list and the most current version of Riverbed documentation, visit the Riverbed Support Web site located at <https://support.riverbed.com>.

The Riverbed Knowledge Base is a database of known issues, how-to documents, system requirements, and common error messages. You can browse titles or search for keywords and strings.

To access the Riverbed Knowledge Base, log in to the Riverbed Support site located at <https://support.riverbed.com>.

Safety Guidelines

Follow the safety precautions outlined in the *Safety and Compliance Guide* when installing and setting up your equipment.

Important: Failure to follow these safety guidelines can result in injury or damage to the equipment. Mishandling of the equipment voids all warranties. Read and follow safety guidelines and installation instructions carefully.

Many countries require the safety information to be presented in their national languages. If this requirement applies to your country, consult the *Safety and Compliance Guide*. Before you install, operate, or service the Riverbed products, you must be familiar with the safety information. Refer to the *Safety and Compliance Guide* if you do not clearly understand the safety information provided in the product documentation.

Contacting Riverbed

This section describes how to contact departments within Riverbed.

Internet

You can learn about Riverbed products through our Web site at <http://www.riverbed.com>.

Technical Support

If you have problems installing, using, or replacing Riverbed products, contact Riverbed Support or your channel partner who provides support. To contact Riverbed Support, open a trouble ticket by calling 1-888-RVBD-TAC (1-888-782-3822) in the United States and Canada or +1 415 247 7381 outside the United States. You can also go to <https://support.riverbed.com>.

Professional Services

Riverbed has a staff of professionals who can help you with installation, provisioning, network redesign, project management, custom designs, consolidation project design, and custom coded solutions. To contact Riverbed Professional Services, email proserve@riverbed.com or go to http://www.riverbed.com/services-training/#Consulting_Services.

Documentation

The Riverbed Technical Publications team continually strives to improve the quality and usability of Riverbed documentation. Riverbed appreciates any suggestions you might have about its online documentation or printed materials. Send documentation comments to techpubs@riverbed.com.

CHAPTER 1 **Product Overview**

This chapter provides an overview of common terms, new features, upgrade instructions, technical and environmental specifications, and a description of the status lights for the system. This chapter includes the following sections:

- [“Overview of the Steelhead Appliance” on page 9](#)
- [“New Features in Version 8.6” on page 14](#)
- [“Upgrading RiOS to v8.6” on page 15](#)

Overview of the Steelhead Appliance

The causes for slow throughput in WANs are well known: high delay (round-trip time or latency), limited bandwidth, and chatty application protocols. Large enterprises spend a significant portion of their information technology budgets on storage and networks, much of it spent to compensate for slow throughput, by deploying redundant servers and storage, and the required backup equipment. Steelhead appliances enable you to consolidate and centralize key IT resources to save money, reduce capital expenditures, simplify key business processes, and improve productivity.

With the Steelhead appliance, you can solve a range of problems affecting WANs and application performance, including:

- Insufficient WAN bandwidth
- Inefficient transport protocols in high-latency environments
- Inefficient application protocols in high-latency environments

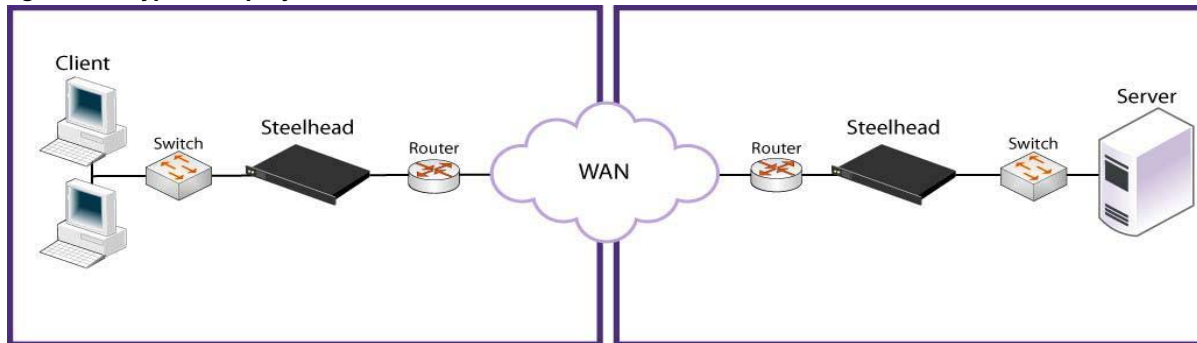
The Riverbed Optimization System (RiOS) intercepts client-server connections without interfering with normal client-server interactions, file semantics, or protocols. All client requests are passed through to the server normally, while relevant traffic is optimized to improve performance.

The optimization techniques RiOS utilizes are:

- **Data Streamlining** - Steelhead appliances and Steelhead Mobile can reduce WAN bandwidth utilization by 65% to 98% for TCP-based applications using Data Streamlining. In addition to traditional techniques like data compression, RiOS also uses a Riverbed proprietary algorithm called Scalable Data Referencing (SDR). SDR breaks up TCP data streams into *unique data chunks* that are stored in the hard disk (*RiOS data store*) of the device running RiOS (a Steelhead appliance or Steelhead Mobile host system). Each data chunk is assigned a unique integer label (*reference*) before it is sent to a peer RiOS device across the WAN. When the same byte sequence is seen again in future transmissions from clients or servers, the reference is sent across the WAN instead of the raw data chunk. The peer RiOS device (a Steelhead appliance or Steelhead Mobile host system) uses this reference to find the original data chunk on its RiOS data store, and reconstruct the original TCP data stream.
- **Transport Streamlining** - Steelhead appliances use a generic latency optimization technique called Transport Streamlining. Transport Streamlining uses a set of standards and proprietary techniques to optimize TCP traffic between Steelhead appliances. These techniques:
 - ensure that efficient retransmission methods, such as TCP selective acknowledgements, are used.
 - negotiate optimal TCP window sizes to minimize the impact of latency on throughput.
 - maximize throughput across a wide range of WAN links.
- **Application Streamlining** - In addition to Data and Transport Streamlining optimizations, RiOS can apply application-specific optimizations for certain application protocols: for example, CIFS, MAPI, NFS, TDS, HTTP, Oracle Forms.
- **Management Streamlining** - Management Streamlining refers to the methods that Riverbed has developed to simplify the deployment and management of RiOS devices. These methods include:
 - **Auto-Discovery Process** - Auto-discovery enables Steelhead appliances and Steelhead Mobile to automatically find remote Steelhead appliances, and to then optimize traffic using them. Auto-discovery relieves you from having to manually configure large amounts of network information. The auto-discovery process enables administrators to control and secure connections, specify which traffic is to be optimized, and specify peers for optimization.
 - **Central Management Console (CMC)** - The CMC enables remote Steelhead appliances to be automatically configured and monitored. It also gives you a single view of the overall benefit and health of the Steelhead appliance network.
 - **Steelhead Mobile Controller** - The Mobile Controller is the management appliance you use to track the individual health and performance of each deployed software client, and to manage enterprise client licensing. The Mobile Controller enables you to see who is connected, view their data reduction statistics, and perform support operations such as resetting connections, pulling logs, and automatically generating traces for troubleshooting. You can perform all of these management tasks without end user input.

The Steelhead appliance is typically deployed on a LAN, with communication between appliances taking place over a private WAN or VPN. Because optimization between Steelhead appliances typically takes place over a secure WAN, it is not necessary to configure company firewalls to support Steelhead appliance specific ports.

Figure 1-1. Typical Deployment



For detailed information about how the Steelhead appliance works and deployment design principles, see the *Steelhead Appliance Deployment Guide*.

Auto-Discovery Process

Auto-discovery enables Steelhead appliances to automatically find remote Steelhead appliances and to optimize traffic to them. Auto-discovery relieves you of having to manually configure the Steelhead appliances with large amounts of network information. The auto-discovery process enables you to control and secure connections, specify which traffic is optimized, and specify how remote peers are selected for optimization. There are two types of auto-discoveries, original and enhanced.

Enhanced auto-discovery (RiOS v4.0.x or later) automatically discovers the last Steelhead appliance in the network path of the TCP connection. In contrast, the original auto-discovery protocol automatically discovers the first Steelhead appliance in the path. The difference is only seen in environments where there are three or more Steelhead appliances in the network path for connections to be optimized. Enhanced auto-discovery works with Steelhead appliances running the original auto-discovery protocol (RiOS v4.0.x or later).

Configuring Optimization

You configure optimization of traffic using the Management Console or the Riverbed CLI. You configure the type of traffic a Steelhead appliance optimizes and specify the type of action it performs using:

- **In-Path rules** - In-path rules determine the action a Steelhead appliance takes when a connection is *initiated*, usually by a client. In-path rules are used only when a connection is initiated. Because connections are usually initiated by clients, in-path rules are configured for the initiating, or client-side Steelhead appliance. You configure one of the following types of in-path rule actions:
 - **Auto Discover** - Use the auto-discovery process to determine if a remote Steelhead appliance is able to optimize the connection attempting to be created by this SYN packet.
 - **Fixed-Target** - Skip the auto-discovery process and use a specified remote Steelhead appliance as an optimization peer. Fixed-target rules require the input of at least one remote target Steelhead appliance; an optional backup Steelhead appliance might also be specified.
 - **Fixed-Target (Packet Mode Optimization)** - Skip the auto-discovery process and uses a specified remote Steelhead appliance as an optimization peer to perform bandwidth optimization on TCPv4, TCPv6, UDPv4, or UDPv6 connections. Packet-mode optimization rules support both physical in-path and master/backup Steelhead appliance configurations. For details, see the *Steelhead Appliance Management Console User's Guide*.
 - **Pass-Through** - Allow the SYN packet to pass through the Steelhead appliance. No optimization is performed on the TCP connection initiated by this SYN packet.
 - **Discard** - Drop the SYN packet silently.
 - **Deny** - Drop the SYN packet and send a message back to its source.
- **Peering rules** - Peering rules determine how a Steelhead appliance reacts when it sees a probe query. Peering rules are an ordered list of fields a Steelhead appliance uses to match with incoming SYN packet fields: for example, source or destination subnet, IP address, VLAN, or TCP port, as well as the IP address of the probing Steelhead appliance. This is especially useful in complex networks. There are the following types of peering rule are available:
 - **Auto** - If the receiving Steelhead appliance is not using enhanced auto-discovery, this has the same effect as the Accept peering rule action. If enhanced auto-discovery is enabled, the Steelhead appliance only becomes the optimization peer if it is the last Steelhead appliance in the path to the server.
 - **Accept** - The receiving Steelhead appliance responds to the probing Steelhead appliance and becomes the remote-side Steelhead appliance (that is, the peer Steelhead appliance) for the optimized connection.
 - **Passthrough** - The receiving Steelhead appliance does not respond to the probing Steelhead appliance, and allows the SYN+ probe packet to continue through the network.

For detailed information about in-path and peering rules and how to configure them, see the *Steelhead Appliance Management Console User's Guide*.

Fail-to-Wire (Bypass) Mode

All Steelhead appliance models and in-path network interface cards support a fail-to-wire mode. In the event of a failure or loss of power, the Steelhead appliance goes into bypass mode and the traffic passes through uninterrupted.

Many in-path network interface cards (NICs) also support a fail-to-block mode in which case if there is a failure or loss of power, the Steelhead appliance LAN and WAN interfaces power down and stop bridging traffic. The default failure mode is fail-to-wire mode.

If there is a serious problem with the Steelhead appliance or it is not powered on, it goes into bypass mode to prevent a single point of failure. If the Steelhead appliance is in bypass mode, you are notified in the following ways:

- The Intercept/Bypass status light on the bypass card is triggered. For detailed information about bypass card status lights, see the appendices that follow.
- The Home page of the Management Console displays **Critical** in the Status bar.
- SNMP traps are sent (if you have set this option).
- The event is logged to system logs (syslog).
- Email notifications are sent (if you have set this option).

When the fault is corrected, new connections that are made receive optimization; however, connections made during the fault are not. To force all connections to be optimized, enable the *kickoff* feature. Generally, connections are short-lived and kickoff is not necessary. For detailed information about enabling the kickoff feature, see the *Steelhead Appliance Management Console User's Guide* and the *Steelhead Appliance Deployment Guide*.

When the Steelhead appliance is in bypass mode the traffic passes through uninterrupted. Traffic that was optimized might be interrupted, depending on the behavior of the application-layer protocols. When connections are restored, they succeed, although without optimization.

In an out-of-path deployment, if the server-side Steelhead appliance fails, the first connection from the client fails. After detecting that the Steelhead appliance is not functioning, a ping channel is setup from the client-side Steelhead appliance to the server-side Steelhead appliance. Subsequent connections are passed through unoptimized. When the ping succeeds, processing is restored and subsequent connections are intercepted and optimized.

For detailed information about the **ping** command, see the *Riverbed Command-Line Interface Reference Manual*.

Fail-to-Block (Disconnect) Mode

In fail-to-block mode, if the Steelhead appliance has an internal software failure or power loss, the Steelhead appliance LAN and WAN interfaces power down and stop bridging traffic.

When fail-to-block is enabled, a failed Steelhead appliance blocks traffic along its path, forcing traffic to be re-routed onto other paths (where the remaining Steelhead appliances are deployed). This is only useful if the network has a routing or switching infrastructure that can automatically divert traffic off of the link once the failed Steelhead appliance blocks it.

Note: You can use this with connection-forwarding, the **allow-failure** CLI command, and an additional Steelhead appliance on another path to the WAN to achieve redundancy. For more information, see the *Riverbed Command-Line Interface Reference Manual*.

You set fail-to-block mode in the Steelhead appliance CLI. For detailed information, see the *Steelhead Appliance Deployment Guide*.

New Features in Version 8.6

This section provides an overview of the new features available in RiOS v8.6. For details, see the *Steelhead Appliance Management Console User's Guide*, the *Steelhead Appliance Deployment Guide - Protocols*, the *Steelhead Appliance Deployment Guide*, and the *Riverbed Command-Line Interface Reference Manual*.

- **Path Selection Enhancements** - Includes support for these features:
 - Multiple and single firewalled paths using GRE tunneled paths. You can now create direct tunneled paths to steer traffic over any path that traverses a stateful firewall between the server-side Steelhead appliance and the client-side Steelhead appliance.
 - Firewalled deployments using the Application Flow Engine (AFE) to identify and steer traffic flows.
 - Symmetric and asymmetric traffic flows.
- **New SharePoint Optimization Diagnostic Reporting** - Provides cache hit rates and totals for these SharePoint extensions:
 - Web Distributed Authoring and Versioning (WebDAV) – HTTP/1.1 extension. The local Steelhead appliance proxies transactions, fetching information ahead of time to serve data locally. For example, for directory browsing, the Steelhead appliances fetch structures of subdirectories, caching them for faster response to the client.
 - FrontPage Server Extensions (FPSE), which enable the client application to display the contents of a Web site as a file system.
- **SSL Common Name Support for the AFE** - Improves SSL application classification efficiency by allowing wildcards in SSL common name identification.
- **New Current Connection Details** - Provides more information on QoS classes, applications, and outbound QoS marking for individual connections.
- **Over 350 Additional Applications in the AFE** - Includes significant additions to the number of popular applications recognized by the AFE. The AFE enhancements further classify the various Microsoft Lync workloads. Lync a multi-featured communications suite that goes across many protocols. The AFE covers the majority of the traffic generated between Lync clients and servers.

The AFE greatly eases the process of identifying applications in Steelhead appliances. For a complete list of recognized applications, see the *Steelhead Appliance Management Console User's Guide*.
- **Authentication Scaling and Load Balancing for Secure Protocol Optimization** - Improves the number of authentications per second and availability of domain authentication operations. The improvements meet the requirements of high-load environments for encrypted MAPI and signed-SMB traffic to load balance across multiple domain controllers. They also improve handling in environments where the domain controllers are not local to the server-side Steelhead appliance; for example, the domain controllers in Microsoft Office 365 data centers. For details, see the *Riverbed Command-Line Interface Reference Manual*.
- **MAPI and eMAPI Over IPv6 Optimization** - Provides latency optimization for MAPI and eMAPI over IPv6. Authentication is over IPv4 only. Communication to the domain controller is over IPv4 only.
- **HTTP Optimization Improvements** - Removes the 1 MB bypass limit for Steelhead appliances running RiOS v8.6. The limit is still in effect for a Steelhead appliance peered with a Steelhead appliance running RiOS v8.5.x and earlier. The HTTP cache limit is still 1 MB.
 - RiOS now allows caching of HTTP Vary headers when encoding is set to None. Combine with strip compression to improve the cache hits.

- Added diagnostics for stream splitting.
- **Improved RiOS Data Store Encryption Performance** - Includes several methods to alleviate lock contention, improving encrypted data store throughput and latency.
- **New System Administrator Role** - Includes permission for all other RBM roles and permission to perform appliance administration, minimizing the need to assign an administrator role that grants full read-write access to all areas of the appliance. For details, see the *Riverbed Command-Line Interface Reference Manual*.
- **SSL Transport Layer Security (TLS) Support** - Enhances security on the inner and outer SSL channels between the client-side and server-side Steelhead appliances. Support includes the TLS version 1.1 and 1.2 encryption protocol. For details, see the *Riverbed Command-Line Interface Reference Manual*.

Upgrading RiOS to v8.6

RiOS v8.6 is backward compatible with previous RiOS versions. However, to obtain the full benefits of the new features in RiOS v8.6, you must upgrade the client-side and server-side Steelhead appliances on any given WAN link. After you have upgraded all appliances, all the benefits of the v8.6 features and enhancements are available.

Upgrade Considerations

Consider the following before upgrading RiOS:

- You cannot upgrade Series xx20 hardware to RiOS v8.6.
- If you mix RiOS software versions in your network, the releases might support different optimization features and you cannot take full advantage of the features that are not part of the older software versions.
- RiOS v8.6 uses more data points to improve statistic reporting for many reports. The upgrade backs up all preexisting report statistics and converts them into the new granularity, by scaling each two-hour data points for a month to 5-minute points throughout.
- To use terminated TCP optimization after upgrading from RiOS v8.0.x to v8.6, you must change any existing in-path rule used for packet-mode IPv4 or IPv6 optimization to a terminated optimization rule.
- Upgrading from RiOS v8.0.x (or earlier) to v8.6 might require a configuration modification to deployments optimizing only the server-to-client direction of a TCPv6 connection using packet-mode.

Consider a deployment running RiOS v8.0 with packet-mode optimization enabled on the client- and server-side Steelhead appliance. The server-side Steelhead appliance is configured with server-to-client fixed-target packet-mode rules. As a result, any traffic flowing from the server to the client for connections that originated at the client receive packet-mode optimization.

The packet-mode rules exist only on the server-side Steelhead appliance. No other rules are configured on the client- or server-side Steelhead appliances.

Because the client-side Steelhead appliance does not have fixed-target rules matching the client to server traffic, it passes it through according to the default TCPv6 rule.

After upgrading the client- and server-side Steelhead appliances to RiOS v8.6 in this deployment scenario, connections originating from the client toward the server now receive terminated TCP optimization. This happens because RiOS 8.6 supports terminated optimization for TCPv6 and the connections originating from the client now match the default optimization (terminated-mode) rule on the client-side Steelhead appliance. As a result, the server-to-client traffic of these connections also receives terminated TCP optimization.

To continue passing through the client-to-server traffic and optimizing the server-to-client traffic using packet-mode, as before the upgrade, you need to configure a pass-through in-path rule on the client-side Steelhead appliance.

Recommended Upgrade Paths

To find allowed upgrades between RiOS versions and recommended upgrade paths, use the Software Upgrade tool on the Riverbed Support site at <https://support.riverbed.com>. The tool includes all of the recommended intermediate RiOS versions.

Upgrading the RiOS Software Version

Follow these steps to upgrade your RiOS software. These instructions assume you are familiar with the Steelhead appliance, the CLI, and the Management Console.

To upgrade the RiOS software version

1. Download the software image from the Riverbed Support site to a location such as your desktop. Optionally, in RiOS v8.6, you can download a delta image directly from the Riverbed Support site to the Steelhead appliance. The downloaded image includes only the incremental changes. The smaller file size means a faster download and less load on the network. To download a delta image, skip to step 2.
2. Log in to the Management Console using the Administrator account (admin).
3. Choose **Configure > Maintenance > Software Upgrade** page and choose one of the following options:
 - **From URL** - Type the URL that points to the software image. Use one of the following formats:
`http://host/path/to/file`
`https://host/path/to/file`
`ftp://user:password@host/path/to/file`
`scp://user:password@host/path/to/file`
 - **From Riverbed Support Site** - Select the target release number from the drop-down list to download a delta image directly to the appliance from the Riverbed Support site. The downloaded image includes only the incremental changes. You do not need to download the entire image. The system downloads and installs the new image immediately after you click **Install**. To download and install the image later, schedule another date or time before you click **Install**.
 - **From Local File** - Browse your file system and select the software image.
 - **Schedule Upgrade for Later** - Select this check box to schedule an upgrade for a later time. Type the date and time in the Date and Time text boxes using these formats:
`YYYY/MM/DD` and `HH:MM:SS`.
4. Click **Install** to immediately upload and install the software upgrade on your system, unless you schedule it for later.

The software image can be quite large; uploading the image to the system can take a few minutes. Downloading a delta image directly from the Riverbed Support site is faster because the downloaded image includes only the incremental changes and is downloaded directly to the appliance.

As the upgrade progresses, status messages appear.

After the installation is complete, you are reminded to reboot the system to switch to the new version of the software.

5. Choose **Configure > Maintenance > Reboot/Shut Down** and click **Reboot**.

The appliance can take a few minutes to reboot. This is normal behavior as the software is configuring the recovery flash device. Do not press Ctrl-C, unplug, or otherwise shut down the system during this first boot. There is no indication displayed during the system boot that the recovery flash device is being configured.

After the reboot, the Home page, Software Upgrade, and Support pages of the Management Console display the RiOS version upgrade.

Downgrading the RiOS Software Version

If you are downgrading to a previous version of the RiOS software, you must downgrade to a version of the software that has previously run on your system.

Note: When downgrading from an image that supports four 10 GigE cards to an older image that does not, the message `Updating BIOS`. Do not interrupt or reboot till the command completes appears. This message indicates that the appropriate BIOS for your software image is being installed.

CHAPTER 2 Managing Riverbed Licenses

This chapter describes the Riverbed licensing methods and how to manage Riverbed licenses. It includes the following sections:

- “Riverbed Licensing Methods” on page 19
- “Automatic Licensing” on page 20
- “Retrieving Licenses Using the Riverbed Licensing Portal” on page 21
- “Installing Your License Keys” on page 22

Riverbed Licensing Methods

A license is a string issued by Riverbed that embeds information that ties the license to data to prevent tampering. After you install the license, the system saves it in the configuration database and enables the functionality associated with the license. Riverbed employs the following licensing methods:

- **Automatic Licensing** - After you connect your Steelhead appliance to the network, the Steelhead appliance automatically contacts the Riverbed Licensing Portal and downloads and installs the licenses.
- **Manual Licensing** - You can manually fetch and activate licenses for Riverbed products using the Riverbed Licensing Portal. Go to <https://licensing.riverbed.com/index.htm> and follow the instructions to retrieve and activate license keys.
- **Factory Licensing** - You can have all your Riverbed licenses installed at the factory for a small fee.
- **Token Method** - You use tokens to activate Riverbed software, such as the Virtual Steelhead Mobile, Virtual Whitewater gateway, Virtual Steelhead, and HP ProCurve. For detailed information, see the respective installation guides for these products.

Automatic Licensing

Automatic licensing allows the Steelhead appliance, once connected to the network, to automatically contact the Riverbed Licensing Portal to retrieve and install license keys onto the appliance. Automatic licensing simplifies inventory management and provides an automated mechanism of fetching licenses for Riverbed products without having to manually activate individual appliances and licenses.

If you are behind a firewall you can retrieve licenses at the Riverbed Licensing Portal using the email option or by downloading an XML file to the Central Management Console. For detailed information, see [“Retrieving Licenses Using the Riverbed Licensing Portal” on page 21](#).

Automatic licensing also works over a web proxy. For details on setting up a web proxy, see the *Steelhead Appliance Management Console User’s Guide*.

Tip: If automatic licensing fails, an error message appears in the Management Console. Go to the Riverbed Licensing Portal and follow the instructions for retrieving your licenses.

To view licenses on a new Steelhead appliance

- Connect the new Steelhead appliance to the network.
The Steelhead appliance automatically contacts the Riverbed Licensing Portal which downloads and installs the licenses. The Management Console Licensing page displays a success message or the Alarm Status page reports an actionable error message.

To replace expired licenses

- Purchase new downloadable licenses to replace the expired license.
At the time of the next scheduled automatic license fetch, the Steelhead appliance automatically contacts the Riverbed License Portal and downloads the new licenses. The Management Console Licensing page displays a success message or the Alarm Status page reports an actionable error message. You do not need to delete the expired license. The system uses the license with the latest expiration date.

To fetch a license on demand

1. In the Management Console choose **Configure > Maintenance > Licenses** to display the Licenses page.
2. Click **Fetch Updates Now**.
The Management Console Licensing page displays a success message or the Alarm Status page reports an actionable error message.

Note: Only administrator users can fetch and install licenses. For detailed information on administrator and monitor users, see the *Steelhead Appliance Management Console User’s Guide*.

Manual Licensing Using the Riverbed Licensing Portal

You can retrieve and manage Riverbed licenses using the Riverbed Licensing Portal. Once you retrieve a license from the Riverbed Licensing Portal, you need to install it.

Retrieving Licenses Using the Riverbed Licensing Portal

The licensing portal requires a unique product identifier to retrieve a license. Depending on the product, the identifier can be a serial number, a license request key (activation code), or a token. The steps to retrieve a license vary based on the product identifier. Online instructions guide you through the process.

To retrieve your licenses for an appliance using a serial number

1. Go to the License Activation page in the Riverbed Licensing Portal at <https://licensing.riverbed.com/index.htm>
2. Enter your appliance serial number as your unique product identifier.
The serial number is on a label located on your appliance and it also appears in the Support tab of the Management Console.
3. Click **Next**.
4. Provide the contact information for the license, including your name and email.
5. Click **Submit**.
The Licensing Portal displays license information for all the products purchased with the serial number you specified.
6. Click a serial number to see license details.
7. Optionally, if you are behind a firewall, type the email address in the Email address text box and click **Email Keys** to have the license keys emailed to you.
8. Optionally, if you are behind a firewall, click **Download XML** to download an XML file. The XML file can be imported by the Central Management Console.

Tip: Click **New Search** to look for additional license records.

Installing Your License Keys

Because each license key is generated for a specific appliance, ensure that you install your license key on the appropriate appliance.

To install a license using the CLI

1. Connect to the CLI of the appliance and enter configuration mode.

For details see the *Riverbed Command-Line Interface Reference Manual*.

2. At the system prompt, enter the following commands:

```
license install <the license key you retrieved from Riverbed Licensing Portal>
write memory
```

To install a license using the Management Console

1. Connect to the Management Console of the appliance.

For details, see the *Steelhead Appliance Management Console User's Guide*.

2. Choose Configure > Maintenance > Licenses to display the Licenses Page.
3. Copy and paste the license key provided by Riverbed Licensing Portal into the text box. Separate multiple license keys with a space, Tab, or Enter.

CHAPTER 3 Installing and Configuring the Steelhead Appliance

This chapter describes how to install and configure the Steelhead appliance in an in-path and out-of-path network deployment. This chapter includes the following sections:

- [“Choosing a Network Deployment” on page 23](#)
- [“Checking Your Inventory” on page 25](#)
- [“Preparing Your Site for Installation” on page 26](#)
- [“Powering On the System” on page 29](#)
- [“Configuring In-Path Steelhead Appliances” on page 30](#)
- [“Configuring Out-of-Path Steelhead Appliances” on page 40](#)

Important: Read and follow the safety guidelines described in the *Safety and Compliance Guide*. Failure to follow these safety guidelines can result in damage to the equipment.

Choosing a Network Deployment

Typically, you deploy the Steelhead appliance on a LAN, with communication between appliances taking place over a private WAN or VPN. Because optimization between Steelhead appliances typically takes place over a secure WAN, you do not need to configure company firewalls to support Steelhead-specific ports.

Note: If there are one or more firewalls between two Steelhead appliances, ports 7800 and 7810 must be passed through firewall devices located between the pair of Steelhead appliances. Also, SYN and SYN/ACK packets with the TCP option 76 must be passed through firewalls for auto-discovery to function properly.

For optimal performance, you should minimize latency between Steelhead appliances and their respective clients and servers. Steelhead appliances should be as close as possible to your network end points (client-side Steelhead appliances should be as close to your clients as possible and server-side Steelhead appliances should be as close to your servers as possible).

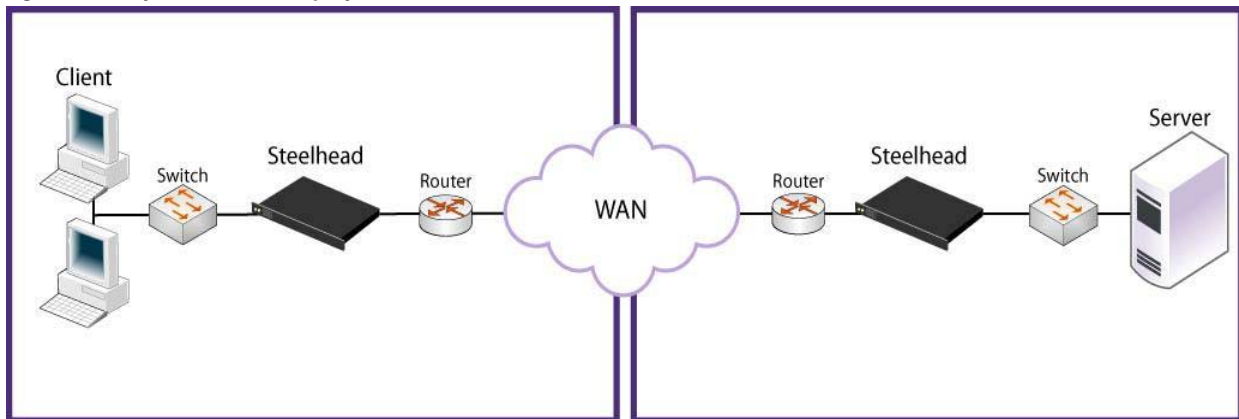
Ideally, Steelhead appliances optimize only traffic that is initiated or terminated at their local site. The best and easiest way to achieve this is to deploy the Steelhead appliances where the LAN connects to the WAN, and not where any LAN-to-LAN or WAN-to-WAN traffic can pass through (or be redirected to) the Steelhead appliance.

For detailed information about your deployment options and best practices for deploying Steelhead appliances, see the *Steelhead Appliance Deployment Guide*.

Before you begin the installation and configuration process, you must select a network deployment:

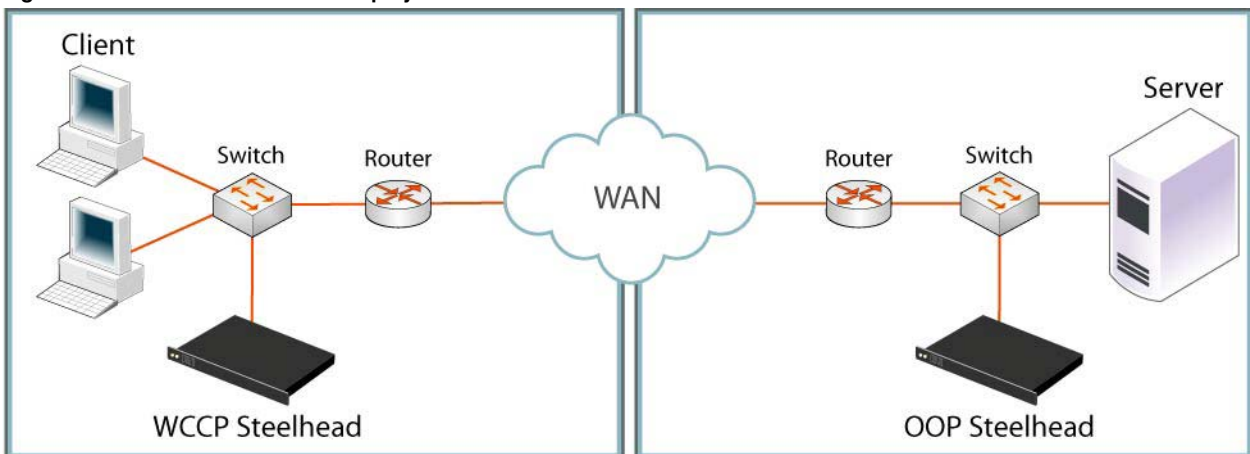
- **Physical In-Path** - In a physical in-path deployment, the Steelhead appliance is *physically* in the direct path between clients and servers. The clients and servers continue to see client and server Internet Protocol (IP) addresses. In-path designs are the simplest to configure and manage, and the most common type of Steelhead appliance deployment, even for large sites.

Figure 3-1. Physical In-Path Deployment



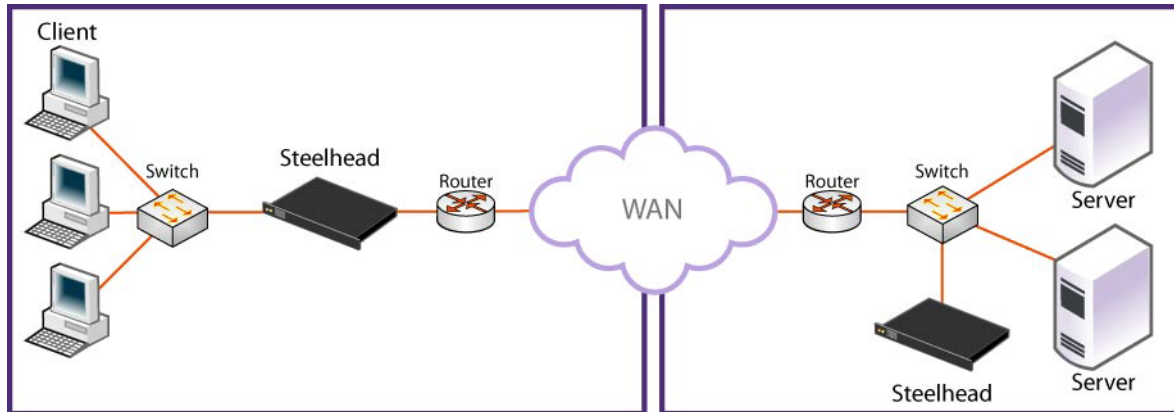
- **Virtual In-Path** - In a virtual in-path deployment, a redirection mechanism (such as WCCP, PBR, or Layer-4 switching) is used to place the Steelhead appliance virtually in the path between clients and servers.

Figure 3-2. Virtual In-Path: WCCP Deployment



- **Out-of-Path** - In an out-of-path deployment, the server-side Steelhead appliance is not in the direct path between the client and the server. In an out-of-path deployment, the Steelhead appliance acts as a proxy. This type of deployment might be suitable for locations where physical in-path or virtual in-path configurations are not possible.

Figure 3-3. Out-of-Path Deployment



Checking Your Inventory

Your shipping carton contains the following items:

- The Steelhead appliance
- One standard Ethernet straight-through cable
- One standard Ethernet crossover cable
- One serial null-modem cable
- One or two power cables (depending on your order)

Aside from country-specific requirements, all systems ship with the same power cable. The power cable has a IEC 60320 C13 plug on one end (to connect to the Steelhead appliance) and a country-specific plug that fits the wall socket for that country. If a system has two power supplies, it ships with two suitable cables.

You must always connect the Steelhead appliance using either the cable in the accessories box or another cable that is approved for use by the IEC in the country in which the appliance is connected.

You cannot connect a Steelhead appliance directly to multiphase outlets. You must use a rack PDU or power strip that provides the appropriate three-prong outlet (hot/neutral/ground). For details, see the Knowledge Base solution number 1301.

- One Phillips screwdriver
- Rails are preinstalled on the Series xx50 and xx60 platforms
- One mounting kit
- Documentation kit

If any items are damaged or missing, notify Riverbed Support at <https://support.riverbed.com> for replacement or repair.

Preparing Your Site for Installation

The Steelhead appliance is shipped completely assembled, with all the equipment parts in place and securely fastened.

Site Requirements

Before you install the Steelhead appliance, make sure that your site meets the following requirements:

- It is a standard electronic environment where the ambient temperature does not exceed 40° C (104° F) and the relative humidity does not exceed 80% (noncondensing). For detailed information, see the appendices that follow.
- Ethernet connections are available within the standard Ethernet limit.
- There is available space on a two-post or four-post 19-inch rack. For details about installing the Steelhead appliance to a rack, see the *Rack Installation Guide* or the printed instructions that were shipped with the system.
- A clean power source is available, dedicated to computer devices and other electronic equipment.
- The rack is a standard 19-inch Telco-type mounting rack.

Note: Riverbed recommends that you use a four-post mounting rack for 2U and 3U systems.

Note: If your rack requires special mounting screws, contact your rack manufacturer.

Steelhead Appliance Ports

The following table summarizes the ports used to connect the Steelhead appliance to your network.

Port	Description
Console	Connects the serial cable to a terminal device. You establish a serial connection to a terminal emulation program for console access to the configuration wizard and the Steelhead CLI.
Primary (PRI)	<p>The management interface that connects the Steelhead appliance to a LAN switch. This management interface enables you to connect to the Management Console and the Steelhead CLI.</p> <p>Tip: The primary and auxiliary ports cannot share the same network subnet.</p> <p>Tip: The primary and in-path interfaces can share the same subnet.</p> <p>Tip: You must use the primary port on the server-side for out-of-path deployments.</p>
Auxiliary (AUX)	<p>An optional port that provides an additional management interface for a secondary network. You cannot have the primary and auxiliary ports on the same subnet.</p> <p>Tip: The auxiliary and in-path interfaces cannot share the same network subnet.</p> <p>Tip: You cannot use the auxiliary port for out-of-path Steelhead appliances.</p>

Port	Description
WAN	Connects the WAN port of the Steelhead appliance and the WAN router using a crossover cable.
LAN	Connects the LAN port of the Steelhead appliance and the LAN switch using a straight-through cable. Note: If the Steelhead appliance is deployed between two switches, both the LAN and WAN ports must be connected with straight-through cables.

Avoiding Duplex Mismatch

Before you begin the configuration process, ensure that your LAN and WAN interfaces have the same duplex settings.

The Steelhead appliance automatically negotiates duplex settings. If one end of the link is set to auto-negotiate and the other end of the link is not set to auto-negotiate, the duplex settings on the network device default to half-duplex. This duplex mismatch passes traffic, but it causes late collisions and results in degraded optimization. To achieve maximum optimization, set your network devices to 100 and full.

To avoid duplex mismatches, manually configure the duplex settings on your:

- router.
- switch.
- Steelhead appliance WAN interface.
- Steelhead appliance LAN interface.
- Steelhead appliance primary interface.

The following can be signs of a duplex mismatch:

- On the Reports > Diagnostics > System Logs page you see errors for sends, receives, CRC, and short sends.
- You cannot connect to an attached device.
- You can connect to a device when you choose auto-negotiation, but you cannot connect to that same device when you manually set the speed or duplex.
- Slow performance across the network.

For detailed information about checking for duplex mismatches, see [Chapter 4, “Troubleshooting.”](#)

Bypass Card Interface Naming Conventions

The interface names for the bypass cards are a combination of the slot number and the port pairs (<slot>_<pair>, <slot>_<pair>). For example, if a four-port bypass card is located in slot 0 of your appliance, the interface names are lan0_0, wan0_0, lan0_1, and wan0_1, respectively. Alternatively, if the bypass card is located in slot 1 of your appliance, the interface names are lan1_0, wan1_0, lan1_1, and wan1_1, respectively.

For detailed information about installing additional bypass cards, see the *Network Interface Card Installation Guide*.

Completing the Configuration Checklist

Before you begin, consult the *Rack Installation Guide* for detailed information about how to install your model to a rack.

The following checklist lists the parameters you specify to complete the initial configuration of the Steelhead appliance. Be prepared to provide values for these parameters.

Appliance	Parameter	Your Value
Steelhead Appliance (the Primary Interface)	Host name	
	IP address	
	Netmask	
	Default gateway (the WAN gateway)	
	DNS IP address	
	Domain name for the system	
	Administrator password	
	SMTP server IP address	
	Events and failures notification email address	
	Primary interface speed	
	Primary interface duplex	
In-Path Deployments	In-path interface IP address	
	In-path netmask	
	In-path gateway	
	In-path: LAN interface speed	
	In-path: LAN interface duplex	
	In-path: WAN interface speed	
	In-path: WAN interface duplex	

Note: The Steelhead appliance automatically negotiates duplex settings. If one end of the link is set to auto-negotiate and the other end of the link is not set to auto-negotiate, the duplex settings on the network device default to half-duplex. This duplex mismatch passes traffic, but it causes late collisions and results in degraded optimization. To achieve maximum optimization, set the network devices to 100 and full.

Powering On the System

The following section describes how to connect the AC power and how to power on the system.

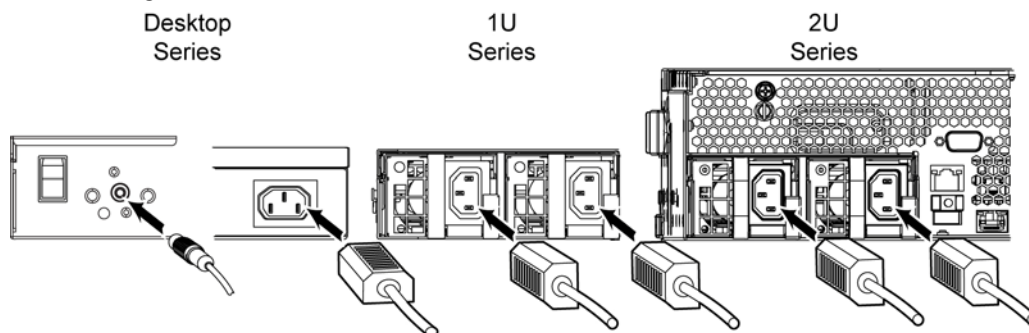
Caution: In European electrical environments you must ground (earth) the Green/Yellow tab on the power cord, or risk electrical shock.

To power on the system

1. If your system has a master power switch, ensure that the system and master power switch is in the off position on the rear of the Steelhead appliance.
2. Plug the AC power cord into the Steelhead appliance.

Note: If your model has multiple power supplies, you must plug in all the power cords or you will hear an alarm.

Figure 3-4. Connecting the AC Power



3. Plug the AC power cord into an uninterrupted AC power source.
4. Press the system power switch on. If the Steelhead appliance does not immediately power on, press the power switch off, then press the power switch on again.
5. Check the status lights on the Steelhead appliance. For detailed information about the status lights, see the appendices that follow.

Note: The Steelhead CX appliance (Series xx55) takes approximately 10 minutes to boot.

Securing the Power Cord on Desktop Systems

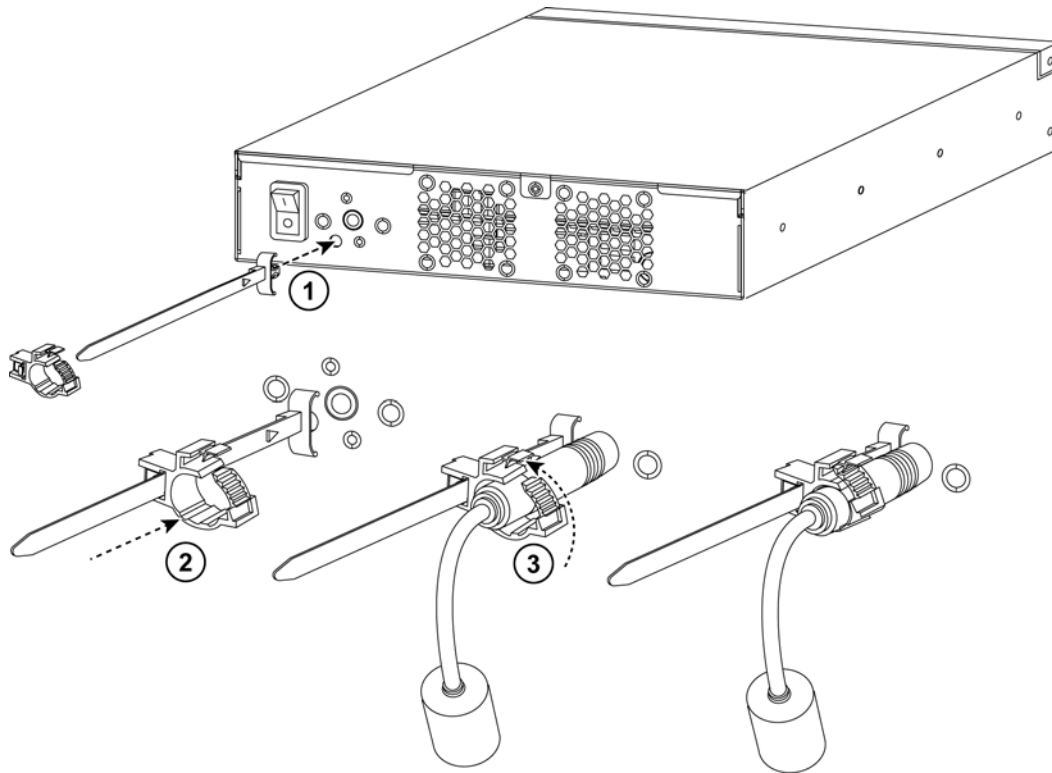
The CX255 models include a power cord retention module. You can install this to reduce the risk of accidentally unplugging the power.

To install the power cord retention module

1. Push the retention module into the socket near the power connection.

The socket is left of the power supply.

2. Attach the retention fastener to module and tighten around the power cable.



The retention module does not prevent accidental pulls from removing the power cord, but it does provide increased protection.

Configuring In-Path Steelhead Appliances

In a physical in-path deployment, the Steelhead appliance is physically in the direct path between clients and servers. The clients and servers continue to see client and server IP addresses. Physical in-path configurations are suitable for any location where the total bandwidth is within the limits of the installed Steelhead appliance. For a detailed figure, see [“Choosing a Network Deployment” on page 23](#).

For detailed information about in-path deployments, see the *Steelhead Appliance Deployment Guide*.

You use standard Ethernet straight-through and crossover cables to connect to your network in an in-path configuration. Make sure that you use the correct cables to establish your network connections:

- **Straight-through cables** - Primary and LAN ports on the appliance to the LAN switch.
- **Crossover cable** - WAN port on the appliance to the WAN router.

Connecting the Steelhead Appliance to Your Network

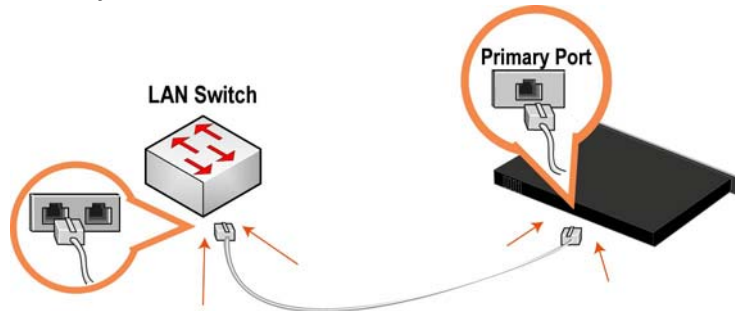
You use standard Ethernet straight-through and crossover cables to connect to your network in an in-path configuration. Make sure that you use the correct cables to establish your network connections:

- **Straight-through cables** - Primary and LAN ports on the appliance to the LAN switch.
- **Crossover cable** - WAN port on the appliance to the WAN router.

To connect to the Steelhead appliance to your network

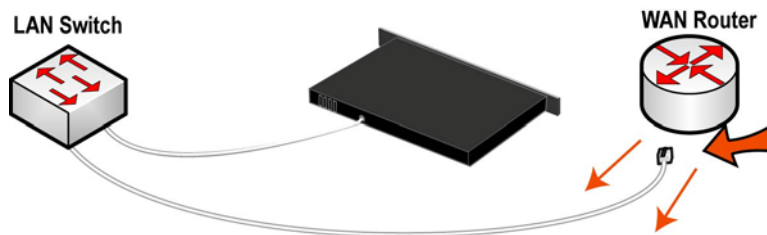
1. Plug the straight-through cable into the primary port of the Steelhead appliance and the LAN switch. This can be any port on your LAN switch configured to connect to a host.

Figure 3-5. Connecting the Primary Port to the LAN Switch



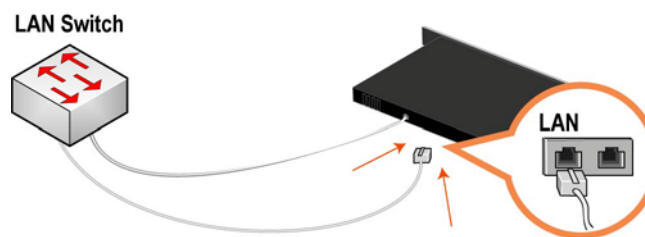
2. Identify the straight-through cable that connects your LAN switch to your WAN router. Unplug the end connected to the WAN router.

Figure 3-6. Disconnecting the WAN Router



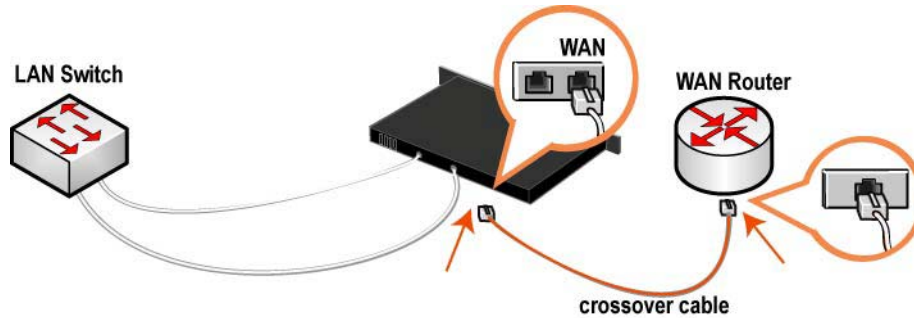
3. Plug the straight-through cable that you disconnected from the WAN router into the LAN port of the Steelhead appliance.

Figure 3-7. Connecting the LAN Switch to the LAN Port



4. Using the provided crossover cable, plug the cable into the WAN port of the Steelhead appliance and the WAN router. This must be a crossover cable.

Figure 3-8. Connecting the WAN Port to the WAN Router



Note: If you have a four-port or six-port bypass card, repeat [Step 1](#) through [Step 4](#). For detailed information about installing additional bypass cards, see the *Network Interface Card Installation Guide*.

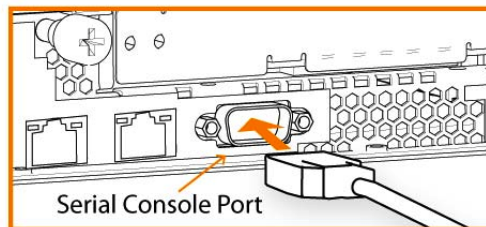
Running the Configuration Wizard

To access the configuration wizard and the Steelhead CLI, you establish a serial connection using a terminal emulator program.

To run the configuration wizard

1. Plug the serial cable into the Serial/Console port and a terminal.

Figure 3-9. Connecting to the Steelhead Appliance



2. Start your terminal emulation program, such as Tera Term Pro. The terminal device must have the following settings:
 - Baud rate: 9600 bps
 - Data bits: 8
 - Parity: none
 - Stop bits: 1
 - vt100 emulation
 - No flow control

If you are using the Steelhead appliance with a terminal server, the terminal server must use hardware flow control for the port connected to the Steelhead appliance.

Riverbed recommends that you connect the console port to a device that logs output. Even though this is not a requirement, it can help you to identify problems with the system.

- Log in as administrator user (`admin`) and enter the default password (`password`). For example,

```
login as: admin
Sent username "admin"
password: password
```

The configuration wizard automatically starts after you have entered the login and default password. After you have established a connection, you configure the Steelhead appliance using the configuration wizard.

- If you have a Central Management Console (CMC) appliance installed in your network to manage multiple Steelhead appliances, you can use it to automatically configure them:

```
Do you want to auto-configure using a CMC? no
```

If you answer **yes**, you are prompted for the CMC host name or IP address. The host name or IP address is used to contact the CMC. The default value is **riverbedcmc**. If you enter **no**, the wizard continues.

Tip: If you mistakenly answer **yes**, to return to the wizard from the CLI, enter the **configuration jump-start** command from configuration mode. For detailed information, see the [“To restart the configuration wizard” on page 35](#).

- To start the configuration wizard, enter **yes** at the system prompt.

```
Do you want to use the configuration wizard for initial configuration? yes
```

Press **Enter** to enter the default value; press **?** for help; press **Ctrl-B** to go back to the previous step.

- Complete the configuration wizard steps on the client-side and the server-side Steelhead appliances as described in the following table.

Wizard Prompt	Description	Example
Step 1: Host name?	Enter the host name for the Steelhead appliance.	hostname? amnesiac
Step 2: Use DHCP on the primary interface?	You are given the option to enable the DHCP to automatically assign an IP address to the primary interface for the Steelhead appliance. Riverbed recommends that you do not set DHCP. The default value is no.	Use DHCP? no
Step 3: Primary IP address?	Enter the IP address for the Steelhead appliance.	Primary IP address? 10.10.10.6
Step 4: Netmask?	Enter the netmask address.	Netmask? 255.255.0.0
Step 5: Default gateway?	Enter the default gateway for the Steelhead appliance.	Default gateway? 10.0.0.1

Wizard Prompt	Description	Example
Step 6: Primary DNS server?	Enter the primary DNS server IP address.	Primary DNS server? 10.0.0.2
Step 7: Domain name?	Enter the domain name for the network where the Steelhead appliance is to reside. If you set a domain name, you can enter host names in the system without the domain name.	Domain name? example.com
Step 8: Admin password?	Riverbed strongly recommends that you change the default administrator password at this time. The password must be a minimum of six characters. The default administrator password is password.	Admin password? xxxyyy
Step 9: SMTP server?	Enter the name of the SMTP server. External DNS and external access for SMTP traffic is required for email notification of events and failures to function. Important: Make sure that you provide a valid SMTP server to ensure that the email notifications for events and failures.	SMTP server? natoma
Step 10: Notification email address?	Enter a valid email address to which notification of events and failures are to be sent.	Notification email address? example@example.com
Step 11: Set the primary interface speed?	Enter the speed on the primary interface (that is, the Steelhead appliance). Make sure that this value matches the settings on your router or switch. The default value is auto.	Set the primary interface speed? [auto] auto
Step 12: Set the primary interface duplex?	Enter the duplex mode on the primary interface. Make sure that this value matches the settings on your router or switch. The default value is auto.	Set the primary interface duplex? [auto] auto
Step 13: Would you like to activate the in-path configuration?	Enter yes at the system prompt to configure in-path support. An in-path configuration is a configuration in which the Steelhead appliance is in the direct path of the client and server. For detailed information about in-path configurations, see the <i>Steelhead Appliance Deployment Guide</i> .	Would you like to activate the in-path configuration? yes
Step 14: In-Path IP address?	Enter the in-path IP address for the Steelhead appliance.	In-Path IP address? 10.11.11.6
Step 15: In-Path Netmask?	Enter the in-path netmask address.	In-Path Netmask? 255.255.0.0
Step 16: In-Path Default gateway?	Enter the in-path default gateway (the WAN gateway).	In-Path Default Gateway? 10.11.11.16

Wizard Prompt	Description	Example
Step 17: Set the in-path: LAN interface speed?	Enter the in-path, LAN interface speed. Make sure that this value matches the settings on your router or switch. The default value is auto.	Set the in-path: LAN interface speed? [auto] auto
Step 18: Set the in-path: LAN interface duplex?	Enter the in-path, LAN duplex value. Make sure that this value matches the settings on your router or switch. The default value is auto.	Set the in-path: LAN interface duplex? [auto] auto
Step 19: Set the in-path: WAN interface speed?	Enter the in-path, WAN interface speed. Make sure that this value matches the settings on your router or switch. The default value is auto.	Set the in-path: WAN interface speed? [auto] auto
Step 20: Set the in-path: WAN interface duplex?	Enter the in-path, WAN duplex speed. Make sure that this value matches the setting on your router or switch. The default value is auto.	Set the in-path: WAN interface duplex? [auto] auto

7. The system confirms your settings.

```

You have entered the following information:
1. Hostname: amnesiac
2. Use DHCP on primary interface: no
3. Primary IP address: 10.10.10.6
4. Netmask: 255.255.0.0
5. Default gateway: 10.0.0.1
6. Primary DNS server: 10.0.0.2
7. Domain name: example.com
8. Admin password: xxxyyy
9. SMTP server: natoma
10. Notification email address: example@example.com
11. Set the primary interface speed: auto
12. Set the primary interface duplex: auto
13. Would you like to activate the in-path configuration: yes
14. In-Path IP address: 10.11.11.6
15. In-Path Netmask: 255.255.0.0
16. In-Path Default gateway: 10.11.11.16
17. Set the in-path:LAN interface speed: auto
18. Set the in-path:LAN interface duplex: auto
19. Set the in-path:WAN interface speed: auto
20. Set the in-path:WAN interface duplex: auto
To change an answer, enter the step number to return to.
Otherwise hit <enter> to save changes and exit.
Choice:

```

The Steelhead appliance configuration wizard automatically saves your configuration settings.

8. To log out of the system, enter the following command at the system prompt:

```
amnesiac> exit
```

To restart the configuration wizard

- Enter the following set of commands at the system prompt:

```
> enable
```

```
# configure terminal
(config) # configuration jump-start
```

For detailed information about the CLI, see the *Riverbed Command-Line Interface Reference Manual*.

Verifying You Are Connected to the Steelhead Appliance

Perform the following tasks to verify that you have properly connected the Steelhead appliance.

To verify you are connected to the Steelhead appliance

1. Verify that you can connect to the CLI using one of the following devices:
 - An ASCII terminal or emulator that can connect to the serial console. It must have the following settings: 9600 baud, 8 bits, no parity, 1 stop bit, vt100, and no flow control.
 - A computer with a Secure Shell (SSH) client that is connected to the Steelhead appliance primary port.

2. At the system prompt, enter the following command:

```
ssh admin@host.domain
```

or

```
ssh admin@ipaddress
```

3. You are prompted for the administrator password. This is the password you set in the configuration wizard.

4. At the system prompt, ping from the management interface:

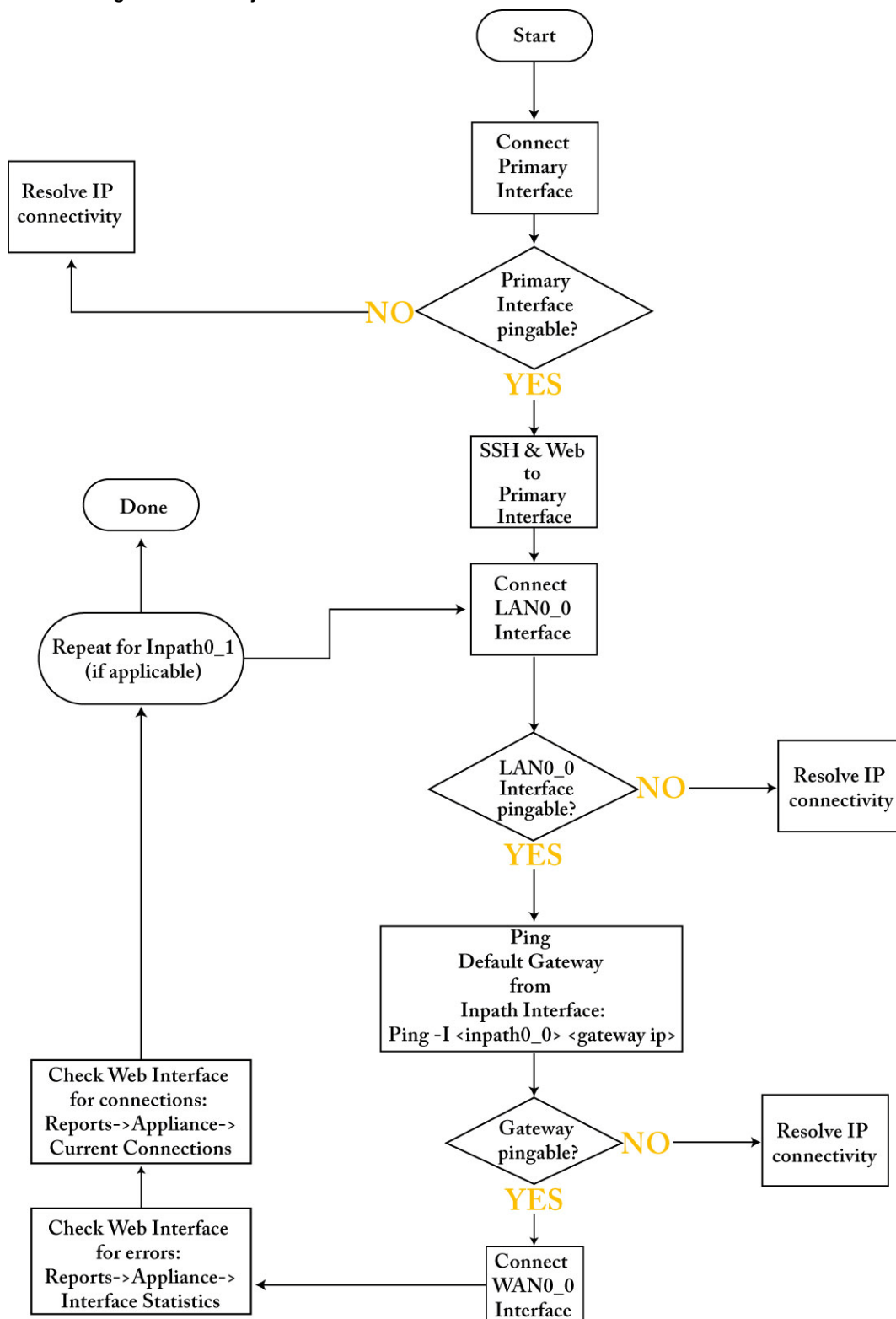
```
ping -I <primary-IP-address> <primary-default-gateway>
```

5. At the system prompt, ping from the in-path default gateway:

```
ping -I <in-path-IP-address> <in-path-default-gateway>
```

If you have problems connecting to the Steelhead appliance, use the following flow chart to trouble shoot issues.

Figure 3-10. Resolving IP Connectivity



Connecting to the Management Console

After you configure the Steelhead appliance, you can check and modify your configuration settings and view performance reports and system logs in the Management Console. You can connect to the Management Console through any supported Web browser.

To connect to the Management Console, you must know the host, domain, and administrator password that you assigned in the configuration wizard.

Note: Cookies and JavaScript must be enabled in your Web browser.

To connect to the Management Console

1. Specify the URL for the Management Console in the location box of your Web browser:

protocol://host.domain

- *protocol* is http or https. HTTPS uses the SSL protocol to ensure that a secure environment. If you use HTTPS to connect, you are prompted to inspect and verify the SSL key.
- *host* is the host name you assigned to the Steelhead appliance during initial configuration. If your DNS server maps that IP address to a name, you can specify the DNS name.
- *domain* is the full domain name for the Steelhead appliance.

Note: Alternatively, you can specify the IP address instead of the host and domain.

The Management Console appears, displaying the Login page.

Figure 3-11. Login Page



Management Console for gen-sh221

Riverbed Steelhead

Username:

Password:

2. In the Username text box, type the user login: admin, monitor, a login from a RADIUS or TACACS+ database, or any local accounts created using the Role-Based Accounts feature. The default login is admin.

Users with administrator (admin) privileges can configure and administer the Steelhead appliance. Users with monitor (monitor) privileges can view the Steelhead appliance reports, user logs, and change their own password. A monitor user cannot make configuration changes.

3. In the Password text box, type the password you assigned in the configuration wizard of the Steelhead appliance. (The Steelhead appliance is shipped with the default password: password.)
4. Click **Log In** to display the Home page.

The Home page summarizes the current status of your system.

Verifying WAN Optimization

Perform the following tasks to verify that you have properly configured the Steelhead appliance.

To verify optimization

1. Go to the Reports > Optimization > Bandwidth Optimization in the Management Console to verify optimization.
2. Map a remote drive on a client machine.
3. Drag and drop a 1 MB file from the client to the remote server.
Ensure that the server is located across the WAN.
4. Drag and drop the 1 MB file again.
Performance improves significantly.

Checking for Speed and Duplex Errors

If you selected auto-negotiation (auto) for your in-path and primary interfaces, you must ensure that the Steelhead appliance negotiated the speed and duplex at the rate your devices expect. For example, ensure settings are auto on the LAN and WAN and 100 FULL on the LAN and WAN. You can verify your speed and duplex settings in the Configure > Networking > Inpath0_0 page and the Configure > Networking > Base Interfaces page of the Management Console.

To check for speed and duplex errors

1. In the Management Console, go to the Reports > Diagnostics > System Logs page.
2. Check the system logs for duplex or speed errors.
3. Go to the Reports > Networking > Current Connections page.
4. Check for duplex and speed errors.

If you find errors, change the speed and duplex settings on your LAN and WAN interface in the Configure > Networking > Inpath 0_0 page.

Configuring Out-of-Path Steelhead Appliances

In an out-of-path deployment, the Steelhead appliance is not in the direct path between the client and the server. Servers see the IP address of the server-side Steelhead appliance rather than the client-side IP address.

An out-of-path configuration is suitable for data center locations where physical in-path or logical in-path configurations are not possible. For a detailed figure, see [“Choosing a Network Deployment” on page 23](#).

For detailed information about out-of-path deployments, see the *Steelhead Appliance Deployment Guide*.

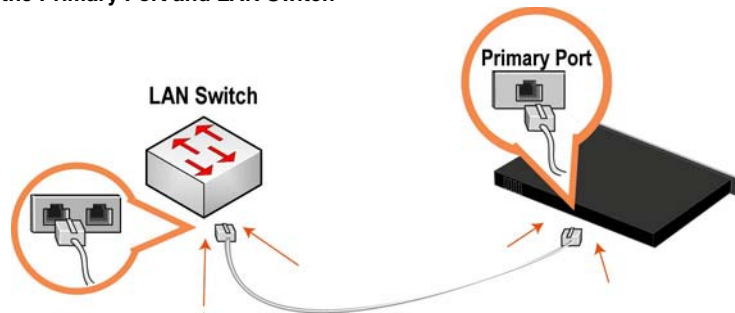
Connecting Out-of-Path Steelhead Appliances to Your Network

You use a standard Ethernet straight-through cable to connect the primary port of the Steelhead appliance to the LAN switch in an out-of-path configuration.

To connect an out-of-path Steelhead appliance to your network

- Plug the straight-through cable into the primary port of the Steelhead appliance and the LAN switch. This can be any port on your LAN switch that is configured to connect to a host.

Figure 3-12. Connecting the Primary Port and LAN Switch



Configuring the Server-Side Steelhead Appliance

The configuration wizard automatically starts when you log in to the Steelhead CLI for the first time. For detailed information about the configuration wizard and how to start it, see [“To run the configuration wizard” on page 32](#).

In an out-of-path configuration, the client-side Steelhead appliance is configured as an in-path device and the server-side Steelhead appliance is configured as an out-of-path device.

To configure the server-side Steelhead appliance

1. Check the duplex and speed settings on the router and switch that connects to your Steelhead appliance. Make sure that the settings on the router, switch, and the Steelhead appliance match. For example, ensure that settings are auto speed and duplex on the LAN and WAN or 100 FULL on the LAN and WAN. If the settings do not match, optimization might be degraded.
2. Connect to the CLI.

- If you have a Central Management Console appliance installed in your network to manage multiple Steelhead appliances, you can use it to automatically configure them.

Do you want to auto-configure using a CMC? no

If you enter **yes**, you are prompted for the CMC host name or IP address. The host name or IP address is used to contact the CMC. The default value is set to **riverbedcmc**. If you enter **no**, the wizard continues.

- To start the configuration wizard, enter **yes** at the system prompt.

Do you want to use the configuration wizard for initial configuration? yes

Tip: If you mistakenly answer **no**, to return to the wizard from the CLI, enter the **configuration jump-start** command from configuration mode. For detailed information, see the [“To restart the configuration wizard” on page 35](#).

- Complete the configuration wizard steps on the client side and server side.

Wizard Prompt	Description	Example
Step 1: Host name?	Enter the host name for the Steelhead appliance.	Hostname? amnesiac
Step 2: Use DHCP on the primary interface?	<p>You are given the option to enable the DHCP to automatically assign an IP address to the primary interface for the Steelhead appliance.</p> <p>Riverbed recommends that you do not set DHCP.</p> <p>The default value is no.</p>	Use DHCP? no
Step 3: Primary IP address?	Enter the IP address for the Steelhead appliance.	Primary IP address? 10.10.10.6
Step 4: Netmask?	Enter the netmask address.	Netmask? 255.255.0.0
Step 5: Default gateway?	Enter the default gateway for the Steelhead appliance.	Default gateway? 10.0.0.1
Step 6: Primary DNS server?	Enter the primary DNS server IP address.	Primary DNS server? 10.0.0.2
Step 7: Domain name?	<p>Enter the domain name for the network where the Steelhead appliance is to reside.</p> <p>If you set a domain name, you can enter host names in the system without the domain name.</p>	Domain name? example.com
Step 8: Admin password?	<p>Riverbed strongly recommends that you change the default administrator password at this time. The password must be a minimum of 6 characters.</p> <p>The default administrator password is password.</p>	Admin password? xxxyyy

Wizard Prompt	Description	Example
Step 9: SMTP server?	Enter the SMTP server. External DNS and external access for SMTP traffic is required for email notification of events and failures to function. Important: Make sure that you provide a valid SMTP server to ensure that the email notifications for events and failures.	SMTP server? natoma
Step 10: Notification email address?	Enter a valid email address to receive email notification of events and failures.	Notification email address? example@example.com
Step 11: Set the primary interface speed?	Enter the speed on the primary interface (that is, the Steelhead appliance). Make sure that this value matches the settings on your router or switch. The default value is auto.	Set the primary interface speed? [auto] auto
Step 12: Set the primary interface duplex?	Enter the duplex mode on the primary interface, and type a value at the system prompt. Make sure that this value matches the settings on your router or switch. The default value is auto.	Set the primary interface duplex? [auto] auto
Step 13: Would you like to activate the in-path configuration?	Enter no at the system prompt to configure in-path support. An in-path configuration is a configuration in which the Steelhead appliance is in the direct path of the client and server. For detailed information about in-path configurations, see the <i>Steelhead Appliance Deployment Guide</i> .	Would you like to activate the in path configuration? no
Step 14: Would you like to activate the out-of-path configuration?	Enter yes at the system prompt to configure out-of-path support. An out-of-path configuration is a configuration in which the Steelhead appliance is not in the direct path of the client and server. For detailed information about in-path configurations, see the <i>Steelhead Appliance Deployment Guide</i> .	Would you like to activate the out-of-path configuration? [no] yes

The system confirms your settings:

```

You have entered the following information:
Step 1: Hostname? amnesiac
Step 2: Use DHCP on primary interface? no
Step 3: Primary IP address? 10.10.10.6
Step 4: Netmask? 255.255.0.0
Step 5: Default gateway? 10.0.0.1
Step 6: Primary DNS server? 10.0.0.2
Step 7: Domain name? example.com
Step 8: Admin password? xxxyyy
Step 9: SMTP server? natoma
Step 10: Notification email address? example@example.com
Step 11: Set the primary interface speed? auto

```



```
Step 12: Set the primary interface duplex? auto
Step 13: Would you like to activate the in-path configuration: no
Step 14: Would you like to activate the out-of-path configuration? yes
```

To change an answer, enter the step number to return to.
Otherwise hit <enter> to save changes and exit.

The Steelhead appliance configuration wizard automatically saves your settings.

6. To log out of the system, enter the following command at the system prompt:

```
amnesiac> exit
```

For details on restarting the configuration wizard, see [“To restart the configuration wizard” on page 35](#).

Configuring the Client-Side Steelhead Appliance

In an out-of-path configuration, you configure the client-side Steelhead appliance in the same way as in an in-path configuration. For optimization to occur, you must define a fixed-target rule on the client-side Steelhead appliance that points to the out-of-path, server-side Steelhead appliance. You can define fixed-target rules using the Management Console or the CLI.

For detailed information about the Management Console, see the *Steelhead Appliance Management Console User's Guide*.

For detailed information about the CLI, see the *Riverbed Command-Line Interface Reference Manual*.

The following procedures describe how to configure in-path rules using the Management Console.

To configure the client-side Steelhead appliance

1. Follow the procedures for an in-path configuration.
For details, see [“Configuring In-Path Steelhead Appliances” on page 30](#).
2. Connect to the Management Console.
For details, see [“Connecting to the Management Console” on page 38](#).

3. Choose **Configure > Optimization > In-Path Rules** page.

Figure 3-13. In-Path Rules Page

Configure > Optimization > In-Path Rules ?

▼ Add a New In-Path Rule — Remove Selected Rules ⇅ Move Selected Rules...

Type: Fixed-Target

Source Subnet: All-IP

Destination Subnet: All-IP Port or Port Label: all

VLAN Tag ID: all

Target Appliance IP Address: . Port: 7810

Backup Appliance IP Address: Port: 7810

Preoptimization Policy: None

Latency Optimization Policy: Normal

Data Reduction Policy: Normal

Auto Kickoff: ☐

Neural Framing Mode: Always

Position: End

Description:

Enable Rule: ☒

Add

	Rule	Type	Source	Destination	VLAN	Protocol	Preoptimization Policy	Latency Policy	Data Reduction Policy	Cloud Acceleration	Kickoff	Status
<input type="checkbox"/>	Q 1	Pass Through	All-IP:*	All-IP:Secure	All	TCP	--	--	--	Auto	--	Enabled
<input type="checkbox"/>	Q 2	Pass Through	All-IP:*	All-IP:Interactive	All	TCP	--	--	--	Auto	--	Enabled
<input type="checkbox"/>	Q 3	Pass Through	All-IP:*	All-IP:RBT-Proto	All	TCP	--	--	--	Auto	--	Enabled
	default	Auto Discover	All-IP:*	All-IP:*	All	--	None	Normal	Normal	Auto	No	Enabled

Description: Default In-Path Rule

4. Under In-Path Rules, click **Add a New In-Path Rule** to display the in-path rule configuration options.
5. For Type, select **Fixed-Target** from the drop-down list.
6. For Target Appliance IP Address, specify the IP address and port number for the peer Steelhead appliance.
Use one of these formats:
XXX.XXX.XXX.XXX/XX (IPv4)
X:X:X::X/XXX (IPv6)
The IP address must be the primary Port IP address on the target Steelhead appliance. The default port is 7810.
7. Optionally, if you have a backup, out-of-path Steelhead appliance in your system (that is, failover support), for Backup Appliance IP Address, specify the IP address and port for the backup appliance in the Backup IP and Port text boxes.
Use one of these formats:
XXX.XXX.XXX.XXX/XX (IPv4)
X:X:X::X/XXX (IPv6)

The default port is 7810.

8. Click **Add** to apply the rule to the running configuration.
9. Click **Save** to write your settings to memory.

For detailed information about verifying your connections and configuration settings, see [“Verifying You Are Connected to the Steelhead Appliance” on page 36](#) and [“Verifying WAN Optimization” on page 39](#).

You can now optimize WAN traffic using the Steelhead appliance.

CHAPTER 4 **Troubleshooting**

This chapter describes how to troubleshoot the Steelhead appliance installation. This chapter describes how to troubleshoot the following issues:

- [“Cables” on page 47](#)
- [“Duplex Mismatch” on page 48](#)
- [“In-Path Steelhead Appliances Connection” on page 49](#)
- [“Oplock Issues” on page 49](#)
- [“CIFS Overlapping Open Optimization Denies Multi-User Access” on page 50](#)
- [“IP Address Configuration” on page 51](#)
- [“Asymmetric Routing” on page 52](#)
- [“Packet Ricochet” on page 52](#)
- [“Packet Ricochet: ICMP Redirects” on page 53](#)
- [“Auto-Discovery Failure” on page 55](#)
- [“Protocol Optimization Errors” on page 55](#)
- [“Server-Side Out-of-Path Connection Caveats” on page 55](#)
- [“Specific Problems” on page 56](#)
- [“Resetting a Lost Password” on page 57](#)
- [“Network Integration Checklist” on page 58](#)

Cables

Improper cabling prevents smooth traffic flows between the Steelhead appliance and the router or switch.

Solution

To ensure that the traffic flows when the Steelhead appliance is optimizing traffic, and when the Steelhead appliance transitions to bypass mode, use the appropriate crossover or straight-through cable to connect the Steelhead appliance to a router or switch. Verify the cable selection by removing the power cable from the appliance, and then test connectivity through it. Make sure that you have connected your cables as follows:

- Steelhead appliance to router: crossover cable
- Steelhead appliance to switch: straight-through cable
- Steelhead appliance to Steelhead appliance: crossover cable
- Steelhead appliance to a host: crossover cable

Duplex Mismatch

The following symptoms occur due to a duplex mismatch:

- Access is not faster after configuring the Steelhead appliance.
- The interface counters display error messages. An alarm or log message about error counts appears.
- The pass-through rule is ineffective. (This is a definite indication of duplex mismatch.)
- There are many retransmissions in packet traces.
- You cannot connect to an attached device.
- You can connect with a device when you choose auto-negotiation, but you cannot connect with the same device when you manually set the speed or duplex.
- Good performance for one direction of data flow, but poor performance in the opposite direction.

Possible Cause

- You have probably set the duplex value for your router to 100Full (fixed) and for the Steelhead appliance to Auto.

Example

The following example shows applications that appear slower with Steelhead appliances configured in an in-path deployment. The timed performance numbers to transfer a 20-MB file over FTP are:

- no Steelhead appliance – 3:16
- cold Steelhead appliance – 5:08
- warm Steelhead appliance – 3:46

Adding a pass-through rule for an application does not help. Slow connections appear as optimized in the Management Console on the Current Connections report page. However, stopping the Steelhead appliance service while leaving the system powered on and an in-path configuration returns performance to original levels.

Solutions

To resolve the duplex mismatch error:

- Connect to the Steelhead appliance CLI and enter the flood-ping command to check the duplex mismatch:

```
ping -f -I >in-path-ip> -s 1400 <clientIP>
```

- Change the interface speed and duplex to match.
- Ensure there is a speed and duplex match between each in-path interface and its peer network interface. If they do not match, you might have a large number of errors on the interface when it is in the bypass mode, because the switch and the router are not set with the same duplex settings. Also, ensure connectivity when service is down.

If matching speed and duplex do not reduce collisions or errors, try hard-setting one end and auto-setting the other. Try the half-duplex mode.

- If all combinations fail, as a last resort, add an intermediary hub or switch that is more compatible with both network interfaces.

In-Path Steelhead Appliances Connection

When there are Steelhead appliances with in-path connection issues, the two sites are connected in-path and you can ping them, but they cannot connect to each other to optimize data.

Possible Cause

The firewall is running port filtering and drops your probe packets. The firewall is filtering the IP and port address of the source and destination (bandwidth limitation) systems.

Solutions

To resolve the Steelhead appliance connection issue:

- open port 7800 on both firewalls.
- use the port visibility mode.
- if there is no encryption, place the Steelhead appliance after the firewall.

Oplock Issues

The following symptoms occur due to opportunistic lock (oplock) issues:

- File access is not faster or tasks such as drag-and-drop are fast but applications might benefit from acceleration.
- The Current Connections report page in the Management Console (select **Reports > Networking > Current Connections**) displays slow connections as optimized.

Possible Causes

- The client is running an old anti-virus software such as McAfee v4.5, the most common type, which competes with the application for an oplock instead of opening as read-only. The antivirus causes multiple file opens.

- The server has oplocks disabled.

Example

You can open a previously-accessed file in 5 seconds on PC1, but you cannot open the same file under 24 seconds on PC2. If you close the file on PC1, you can open it in 5 seconds on PC2. However, it takes you 24 seconds to open the same file on PC1.

Solutions

Windows Common Internet File System (CIFS) uses oplock to determine the level of safety the OS or the application has in working with a file. Oplock is a lock that a client requests on a file in a remote server.

An oplock controls the consistency of optimizations such as read-ahead. Oplock levels are reduced when you make conflicting opens to a file.

To prevent any compromise to data integrity, the Steelhead appliance only optimizes data when a client has exclusive access to the data.

When an oplock is not available, the Steelhead appliance does not perform application-level latency optimization but still performs Scalable Data Referencing (SDR) and data compression as well as TCP optimization. Therefore, even without the benefits of latency optimization, Steelhead appliances still increase WAN performance, but not as effectively as when application optimizations are available.

To resolve oplock issues:

- Upgrade your anti-virus software to the latest version.
- Use Filemon (sysinternals) to check for file access.
- Enable CIFS Overlapping Opens (by default, this function is enabled). For details, see [“CIFS Overlapping Open Optimization Denies Multi-User Access” on page 50](#).
- Ensure that the server has oplock enabled by verifying registry settings on Windows servers or the Filer configuration (for NetApp or EMC servers).
- Run a network analyzer such as Riverbed Cascade Pilot, which is fully integrated with Wireshark, and determine that the server grants oplocks when the client opens a file.
- Check whether the client is running an anti-virus software that is scanning the files over the WAN or that the anti-virus software does not break the oplock.

CIFS Overlapping Open Optimization Denies Multi-User Access

The CIFS overlapping open optimization issue prevents a client from accessing a file when different clients access the file at the same time.

Solution

To resolve the CIFS overlapping open optimization issue, configure CIFS overlapping open optimization on the client-side Steelhead appliance as follows:

1. Connect to the Steelhead Management Console. For details, see the *Steelhead Appliance Management Console User's Guide*.

2. On the client-side Steelhead appliance, choose **Configure > Optimization > CIFS (SMB1)** to display the CIFS (SMB1) page.
3. Under **Overlapping Open Optimization (Advanced)**, complete the configuration as described in the following table.

Control	Description
Enable Overlapping Open Optimization	<p>Enables overlapping opens to obtain better performance with applications that perform multiple opens on the same file: for example, CAD applications. By default, this setting is disabled.</p> <p>Note: Enable this setting on the client-side Steelhead appliance.</p> <p>With overlapping opens enabled, the Steelhead appliance optimizes data where exclusive access is available (when locks are granted). When an oplock is not available, the Steelhead appliance does not perform application-level latency optimizations but still performs SDR and compression on the data as well as TCP optimizations.</p> <p>Note: If a remote user opens a file that is optimized using the overlapping opens feature and a second user opens the same file, they might receive an error message if the file fails to go through a v3.x.x or later Steelhead appliance or if it does not go through a Steelhead appliance: for example, certain applications that are sent over the LAN. If this occurs, you should disable overlapping opens for such applications.</p> <p>Use the radio buttons to set either an include list or exclude list of file types subject to overlapping opens optimization.</p>
Optimize only the following extensions	Specify a list of extensions you want to include in overlapping opens optimization.
Optimize all except the following extensions	Specify a list of extensions you do not want to include. For example, you should specify any file extensions that use Enable Applock Optimization.

4. Click **Apply** to apply your settings to the current configuration.
5. Click **Save** to save your settings permanently.

IP Address Configuration

If you have not configured IP addresses correctly, the Steelhead appliances cannot connect to each other or to your network.

Solutions

To verify the IP address has been configured correctly:

- Ensure the Steelhead appliances are reachable through the IP address, by pinging their primary and in-path interfaces.
 - Ensure that the Steelhead appliances in the network can reach each other through their own interfaces.
- Connect to the Steelhead appliance CLI. For details, see the *Riverbed Command-Line Interface Reference Manual*. Enter the following command to ping from a specific in-path interface on a Steelhead appliance to another in-path interface:

```
ping -f -I {Local-Steelhead appliance-Inpath-IP} -s 1400 {Remote-Steelhead appliance-Inpath-IP}
```

- Ensure that the default gateways, both for the Steelhead appliance and for its in-path interfaces, are correct.
- For physical or virtual in-path installations, verify that the server-side Steelhead appliance can be auto-discovered by the client-side Steelhead appliance.

Connect to the Steelhead appliance CLI. For details, see the *Riverbed Command-Line Interface Reference Manual*. Enter the command:

```
tproxytrace -i inpath0_0 <example-server-IP-address>:<example-server-TCP-port>
```

This causes the Steelhead appliance to generate a fake TCP SYN packet, destined for the specified IP address and TCP port, and send it to the specified in-path interface. A remote Steelhead appliance should respond if it sees the SYN packet.

- Verify that the client-side Steelhead appliance is visible to the server-side Steelhead appliance.

Connect to the Steelhead appliance CLI. For details, see the *Riverbed Command-Line Interface Reference Manual*. Enter the command:

```
tproxytrace -i inpath0_0 <example-client-IP-address>: <example-client-TCP-port>
```

Asymmetric Routing

If there is an asymmetric routing issue, many connections fail during data transfer or they fail to start.

Possible Cause

Asymmetric routing occurs when a TCP connection takes one path to the destination and another when returning to the source. If the Steelhead appliance sees only the LAN to WAN or only the WAN to LAN packets, it cannot optimize the data.

Solutions

To resolve the asymmetric routing issue, do one of the following:

- Rank the following solutions from most to least preferable with respect to complexity and cost and select one:
 - configure a fixed-target rule.
 - use a logical in-path configuration such as WCCP or PBR.
 - use four-port or six-port Steelhead appliance.
 - configure connection-forwarding with two Steelhead appliances.
- Remove the asymmetry.

Packet Ricochet

The following symptoms occur due to packet ricochet:

- Performance is less than expected
- The following log message appears:

```
> [fionr taelrcreeapdt/y lnoactaltekde rnceoln/neiccotireo.n c:119426.316]  
8.n7a3t._1c5h:e1c6k1: 1 SYN ==> packet 192.168.208.12:80 ==> 192.168.72.9:7801
```

Possible Cause

Traffic to the LAN is travelling to the WAN router on the way to the LAN.

Solutions

To resolve packet ricochet issues:

- Change the in-path gateway to the LAN router.
- Add static routes to LAN subnets through the LAN router.
- Enable in-path simplified routing.

Packet Ricochet: ICMP Redirects

The following symptoms occur due to packet ricochet Internet Control Messaging Protocol (ICMP) redirects:

- Connections fail on first attempt, but succeed on second attempt.
- On one or both sites, the in-path interface on the Steelhead appliance is on a different network than the local host.
- There are no in-path routes defined.

Possible Causes

- Traffic to the LAN is travelling to the WAN router on the way to the LAN, but the router drops the packet.
- Outer connections to clients or servers are routed through the WAN interface to the WAN gateway, and then routed through the Steelhead appliance to the next hop LAN gateway.
- The WAN router is probably dropping the SYN from the Steelhead appliance before issuing an ICMP redirect.

Solutions

To resolve the packet ricochet ICMP redirects issue, do one of the following:

- Change the router ICMP configuration to forward the packet or turn off ICMP redirect.
- Change the in-path gateway to the LAN router.
- Add static routes to LAN subnets through the LAN router.
- Enable in-path simplified routing. For details, see [“Simplified Routing” on page 54](#).
- Add in-path routes to local destinations to prevent the ICMP redirect and subsequent drop.

Simplified Routing

Simplified routing changes the process used to select the destination Ethernet address for packets transmitted from in-path interfaces.

Simplified routing collects the IP address for the next hop MAC address from each packet it receives to address traffic. With simplified routing, you can use either the WAN or LAN-side device as a default gateway. The Steelhead appliance learns the right gateway to use by watching where the switch or router sends the traffic, and by associating the next-hop Ethernet addresses with IP addresses. Enabling simplified routing eliminates the need to add static routes when the Steelhead appliance is in a different subnet from the client and the server.

Without simplified routing, if a Steelhead appliance is installed in a different subnet from the client or server, you must define one router as the default gateway and static routes for the other routers so that traffic is not redirected back through the Steelhead appliance. In some cases, even with the static routes defined, the Access Control List (ACL) on the default gateway can still drop traffic that should have gone through the other router. Enabling simplified routing eliminates this issue.

Simplified routing has the following constraints:

- You cannot enable WCCP.
- The default route must exist on each Steelhead appliance in your network.

Tip: For detailed information, see the *Steelhead Appliance Deployment Guide*.

To enable simplified routing

1. Choose **Configure > Networking > Simplified Routing** to display the Simplified Routing page.
2. Under **Mapping Data Collection Setting**, complete the configuration as described in the following table.

Control	Description
Collect Mappings From	Select one of the following options from the drop-down list: <ul style="list-style-type: none">• None - Do not collect mappings.• Destination Only - Collects destination MAC data. Use this option in connection-forwarding deployments. This is the default setting.• Destination and Source - Collect mappings from destination and source MAC data. Use this option in connection-forwarding deployments.• All - Collect mappings for destination, source, and inner MAC data. Also collect data for connections that are <i>un-natted</i> (connections that are not translated using NAT). You cannot enable this option in connection-forwarding deployments. Riverbed recommends that you use this option to maximize the effects of simplified routing.

3. Click **Apply** to save your settings to the running configuration.
4. Click **Save** to save your settings permanently.

Auto-Discovery Failure

When auto-discovery fails, all traffic passes through with the Steelhead appliance in-path (physically or logically).

Possible Causes

- Cisco PIX 7.x or Raptor firewalls
- Satellite
- Intrusion Detection System (IDS) or Intrusion Prevention System (IPS)

Solutions

- Create a fixed-target rule on the client-side Steelhead appliance.
 - Specify the **Target Appliance IP Address** and its port as 7800 on the opposite Steelhead appliance (in-path without auto-discovery).
- Configure end nodes (firewalls) to allow your probe to pass through.
- Configure the Steelhead appliance IP address as the friendly IP address for IDS or IPS.
- Cisco PIX Firewall IOS v7.0 might block the auto-discovery probe. Some firewall configurations strip TCP options or drop packets with these options. You can keep this configuration and switch to fixed-target rules or change the configuration on the firewall.

Protocol Optimization Errors

When there are protocol optimization errors, the Steelhead appliance does not optimize expected protocols.

Solutions

To resolve protocol optimization errors, check:

- that connections have been successfully established.
- that Steelhead appliances on the other side of a connection are turned on.
- for secure or interactive ports that are preventing protocol optimization.
- for any pass-through rules that could be causing some protocols to pass through the Steelhead appliances unoptimized.
- that the LAN and WAN cables are not inadvertently swapped.

Server-Side Out-of-Path Connection Caveats

The following are the caveats for a server-side out-of-path (OOP) Steelhead appliance connection:

- OOP configuration does not support auto-discovery. You must create a fixed-target rule on the client-side Steelhead appliance.

- You must create an OOP connection from an in-path or logical in-path Steelhead appliance and direct it to port 7810 on the primary interface of the server-side Steelhead appliance. This setting is mandatory.
- Interception is not supported on the primary interface.
- An OOP configuration provides non-transparent optimization from the server perspective. Clients connect to servers, but servers treat it like a server-side Steelhead appliance connection. This affects:
 - log files.
 - server-side ACLs.
 - bi-directional applications such as rsh.
- You can use OOP configurations along with in-path or logical in-path configurations.

Specific Problems

The following section describes specific problems you might encounter in the Steelhead appliance.

Problem	Solution
The show interfaces CLI command displays 4294967295 as the number of errors on an interface.	The bypass card is not properly installed; reinstall it. For details, see the <i>Network Interface Card Installation Guide</i> .
The Steelhead appliance blocks traffic when going into bypass mode.	If a Steelhead appliance blocks traffic when going into bypass mode, verify that connections to its neighboring devices are correctly configured. Ensure that the cable from the Steelhead appliance to the switch is a straight-through cable and the cable from the Steelhead appliance to the router is a crossover cable. Also, ensure that there are no network speed or duplex mismatches.
The Steelhead appliance does not come out of bypass mode when the network connection is restored.	<p>If a Steelhead appliance does not come out of bypass mode, verify that:</p> <ul style="list-style-type: none"> • The in-path interface has an IP address. For example, at the system prompt, enter the show interfaces CLI command. • In-path interception is enabled. For example, at the system prompt, enter the show in-path CLI command. Expected results are: Enabled: yes Optimizations Enabled On: inpath0_0 • The bypass service is running. For example, at the system prompt, enter the show service CLI command. To enable the Steelhead appliance service if it is not running, use the CLI command service enable. • You have a valid and active SH10BASE license. Your license file should also contain entries for SH10CIFS and SH10EXCH licenses, even if they have not been activated. For example, at the system prompt, enter the show licenses CLI command. For questions about licenses, contact Riverbed Support at https://support.riverbed.com.
The Steelhead appliance fails to boot.	<p>Ensure that:</p> <ul style="list-style-type: none"> • The power strip or the uninterruptable power supply (UPS) the Steelhead appliance is plugged into is turned on and is functioning properly. • The rocker switch on the back of the Steelhead appliance (Series xx20) is turned on. (When on, the rocker switch is in the depressed, or 1 position.)

Resetting a Lost Password

To reset your password, you must have access to the serial console or monitor and must be able to see the entire boot process to perform these steps:

1. Start, or reboot the appliance.
2. When prompted, press any key to continue.
3. Immediately press E. A GNU GRUB menu appears.
 - For a Steelhead appliance upgraded to 4.0 from 2.0 or 3.0, the menu prompts you to select the Riverbed Steelhead, diagnostics, or a restore/recovery image. Select Riverbed Steelhead and skip to [Step 5](#).
 - For a Steelhead appliance manufactured with 4.0 (that has not had previous versions), the menu prompts you to select the disk image to use. Continue with [Step 4](#).
 - For software versions prior to 4.0, the menu displays root and kernel parameters. Skip to [Step 6](#).
4. Press V or ^ to select the disk image to boot.
5. Press E.

A GRUB menu appears, with options similar to the following:

```
-----
0: root (hd0,1)
1: kernel /vmlinuz ro root=/dev/sda5 console=tty0 console=ttyS0,9600n8
-----
```

6. Press V or ^ to select the kernel boot parameters entry.
7. Press E to edit the kernel boot parameters. The CLI displays a partially completed line of text similar to the following:

```
kernel /vmlinuz ro root=/dev/sda5 console=tty0 console=ttyS0,9600n8
```

8. The line of text contains two console= entries. Modify this line as follows:

- If you are accessing the Steelhead appliance remotely, delete

```
console=tty0
```

- If you are accessing the Steelhead appliance directly (through a keyboard and monitor connected to the appliance), delete

```
console=ttyS0
```

- At the end of the line, type a space and append the line with

```
single fastboot
```

- You must include a space before the word **single**.

Tip: Use the arrow keys to access the entire command line.

9. Press Enter.

10. Press B to continue booting.
The system starts.
11. At the command prompt, enter `/sbin/resetpw.sh`.
The password is blank.
12. Type **reboot** and press Enter to reboot the appliance.

Network Integration Checklist

Before you begin configuring the Steelhead appliance, check the following configuration settings:

- Speed and duplex.
- QoS integration.
- Multi-hop optimization.
- Packet ricochet.
- VPN: Ensure the encryption is on the WAN side of the Steelhead appliance.
- Firewall: Ensure probes are passed, especially Cisco PIX and Raptor. If inside the Steelhead appliance, try probe caching for src IP rules; if outside, check firewall performance.
- In-path: Is it a VLAN trunk? (Configure trunking).
- Incorrectly designed load balancing implementations.
- Remove or manage asymmetry.
- Fail-to-wire or fail-to-block, you need Link State Protocol (LSP) for quicker convergence.
- WCCP or VLAN bridge: Router model and IOS revision.
- Does the network use Network Address Translation (NAT) or Port Address Translation (PAT).

APPENDIX A Series xx55 Specifications

This appendix describes the status lights, ports, and the technical and environmental specifications for the Series xx55 systems. It includes the following sections:

- [“CX255 Specifications” on page 59](#)
- [“CX555 and CX755 Specifications” on page 62](#)
- [“CX1555 Specifications” on page 64](#)
- [“CX5055 and CX7055 Specifications” on page 67](#)

CX255 Specifications

This section describes the status lights, ports, technical and environmental specifications.

Status Lights and Ports

The following figure illustrates the status light and port locations.

Figure A-1. Front Panel

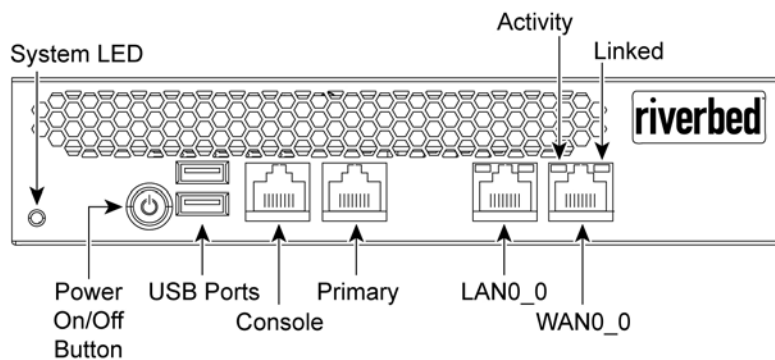
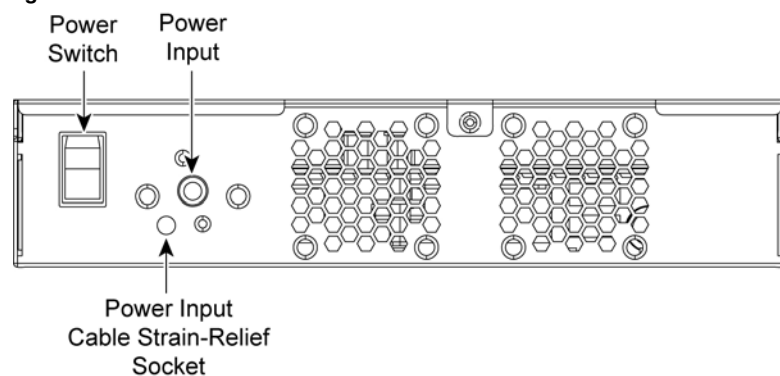


Figure A-2. Back Panel

The following table summarizes the system LEDs.

LED	Status
System	Healthy = Blue Degraded = Yellow Critical = Red Power Off = None
Power Button LED	System Off = No Light Standby Mode = Yellow Power On = Blue
Primary LED	Left LED Link = Green Activity = Blinks Green Right LED GB = Yellow 100 MB = Green 10 MB = No Light (with link on left LED)
LAN/WAN LEDs	Left LED Link = Green Activity = Blinks Green Bypass/Disconnect = Yellow Right LED GB = Yellow 100 MB = Green 10 MB = No Light (with link on left LED)

Technical Specifications

The following table summarizes the technical specifications for the systems.

	CX255 Desktop M-H
Power (Typical)	30 W
VA (max)	63.8
BTU	102 BTU
Hard Disk	320 GB
Data Store	50 GB
Dimensions (LxWxH)	13x8x1.73 in 330x204x44mm
Weight (without packaging)	5.5 lbs 2.4 kg
Voltage Frequency	100-240V 50 - 60 Hz
PSU	Single 84 W External 100-240Vac, 50/60Hz, 2-1 A
Onboard Bypass Ports/ Max # Ports	2

Environmental Specifications

The following table summarizes the environmental requirements for the systems.

	CX255
Operating Acoustic	45 dBA Sound pressure (Typical)
Temperature (Operating)	0° - 45° C 32° - 113° F
Temperature (Storage)	-40° - 65° C -40° - 149° F
Relative Humidity	20% - 80% non-condensing
Storage Humidity	5% - 95% non-condensing

CX555 and CX755 Specifications

This section describes the status lights, ports, technical and environmental specifications.

Status Lights and Ports

The following figure illustrates the status light and port locations.

Figure A-3. Front Panel

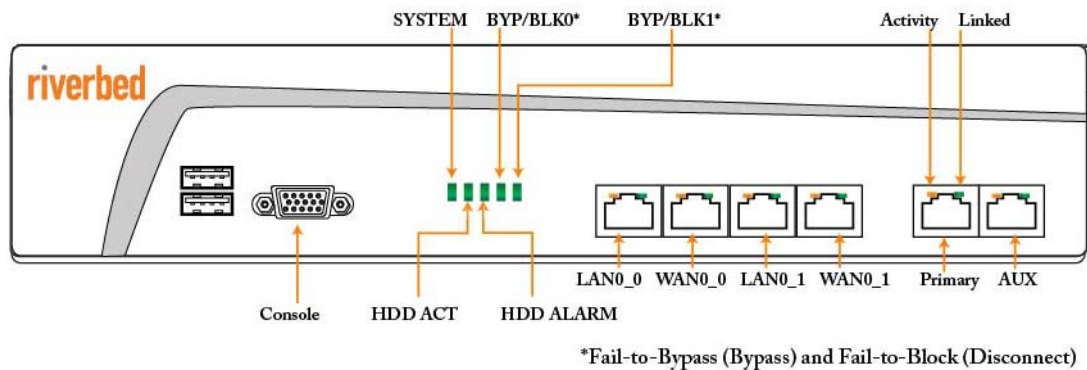
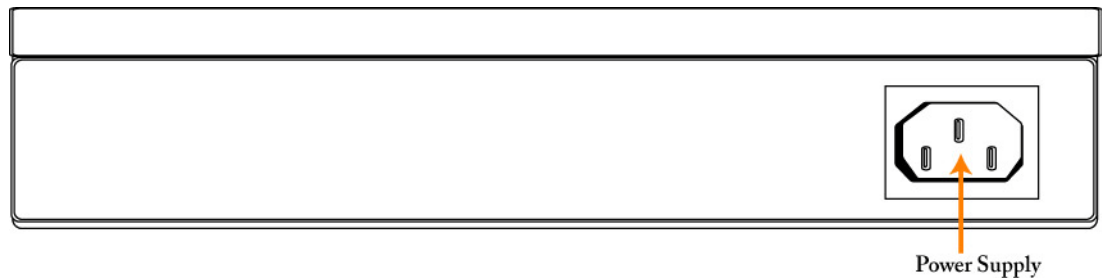


Figure A-4. Back Panel



The following table summarizes the system LEDs.

LED	Status
SYSTEM	Healthy = Blue Degraded = Yellow Critical = Red System Boot = Yellow
	Note: When the appliance is powered down with the power connected (for example, after running a reload halt command), the color of the system LED is undefined and carries no significance. The color can be either red, orange, or purple, depending on the state of the LED prior to shutdown.
HDD ACT	HDD Activity = Blinks Blue

LED	Status
BYP/BLK (Bypass or Block (Disconnect) Mode)	Normal = No Light Bypass or Block (Disconnect) = Orange
HDD ALARM	Disk Connected = Blue Read/Write Activity = Blinks Blue Failed Disk = Orange
LAN-WAN LEDs	Left LED Link = Green Activity = Blinks Green Right LED GB = Green 100-MB = Orange 10-MB = No Light

Technical Specifications

The following table summarizes the technical specifications for the systems.

	CX555 Desktop M-H	CX755 Desktop L-M-H
Power (Typical)	45 W	50 W
VA (max)	62.5	66.5
BTU	145 BTU	165 BTU
Hard Disk	2 x 250 GB	2 x 250 GB H= 1 x 250 GB HDD + 1 x 160 SSD
Data Store	80 GB	100-160 GB
Dimensions (LxWxH)	7.1x12x1.65 in 180.3x304.8x42 mm	7.1x12x1.65 in 180.3x304.8x42 mm
Weight (without packaging)	4.7 lbs 2.15 kg	4.7 lbs 2.15 kg
Voltage Frequency	100-127V, 200-240V	100-127V, 200-240V
PSU	Single 100 W Internal 100-240Vac, 50/60Hz, 2-1 A	Single 100 W Internal 100-240Vac, 50/60Hz, 2-1 A
Onboard Bypass Ports/ Max # Ports	4	4

Environmental Specifications

The following table summarizes the environmental requirements for the systems.

	CX555	CX755
Operating Acoustic	45 dBA Sound pressure (Typical)	45 dBA Sound pressure (Typical)
Temperature (Operating)	0° - 45° C 32° - 113° F	0° - 45° C 32° - 113° F
Temperature (Storage)	-40° - 65° C -40° - 149° F	-40° - 65° C -40° - 149° F
Relative Humidity	20% - 80% non-condensing	20% - 80% non-condensing
Storage Humidity	5% - 95% non-condensing	5% - 95% non-condensing

CX1555 Specifications

This section describes the status lights, ports, technical and environmental specifications.

Status Lights and Ports

The following figure illustrates the status light and port locations.

Figure A-5. Front Panel

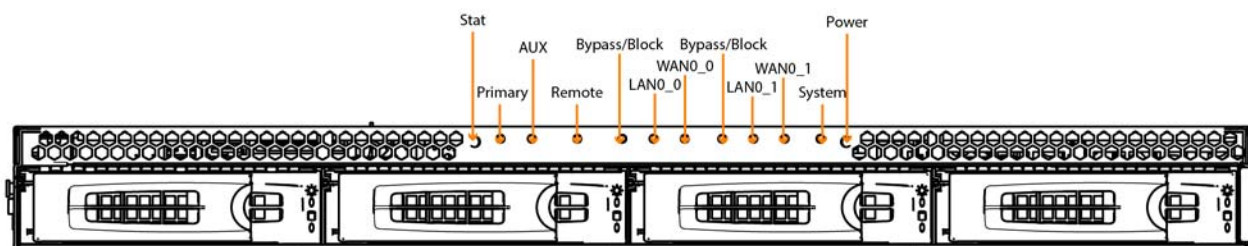
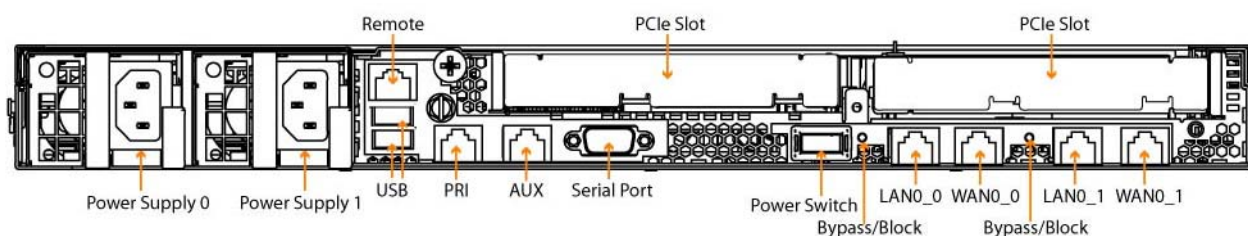


Figure A-6. Back Panel



The following table summarizes the system LEDs.

LED	Status
SYSTEM	Healthy = Blue Degraded = Yellow Critical = Red System Boot = Yellow
PRI = Primary AUX = Auxiliary REM = Remote	Link and Traffic = Blinks Blue
LAN-WAN	Link and Traffic = Blinks Blue
BYP/BLK BYP = Bypass BLK = Block (Disconnect)	Normal = No Light Bypass or Block (Disconnect) = Orange
HDDs/SSDs	Activity LED Disk Connected = Blue Read/Write Activity = Blinks Blue Disk Fault LED Failed Disk = Orange
Back Panel PRI = Primary AUX = Auxiliary REM = Remote	Left LED Link = Green Activity = Blinks Green Right LED GB = Orange 100 MB = Green (REM only at 100 MB) 10 MB = No Light
Back Panel LAN-WAN	Left LED Link = Green Activity = Blinks Green Right LED GB = Orange 100 MB = Green 10 MB = No Light BYP/BLK Normal = No Light Bypass or Block (Disconnect) = Orange

Technical Specifications

The following table summarizes the technical specifications for the systems.

	CX1555 L/M	CX1555 H
Form Factor	1 U	1U
Hard Disk	2 x 250 GB	2 x 500 GB, 2 SSD x 160
Data Store	400 GB	320 GB SSD
Dimensions (LxWxH)	25.4x17.2x1.71 in 645.4x436x43.5 mm	25.4x17.2x1.71 in 645.4x436x43.5 mm
Weight (without packaging)	36 lbs 16.36 kg	4.7 lbs 2.15 kg

	CX1555 L/M	CX1555 H
Voltage Frequency	100-127V, 200-240V	100-127V, 200-240V
PSU	2 x 450 W 100-127Vac/8A, 50/60Hz 200-240Vac/4A, 50/60Hz	2 x 450 W 100-127Vac/8A, 50/60Hz 200-240Vac/4A, 50/60Hz
PCI Slots	2	2
Onboard Bypass Ports/ Max # Ports	4/12	4/12

Power Requirements and Consumption

The following table summarizes the power specifications for the systems. The systems are rated at the following power characteristics when operating at nominal AC input voltages (120 V and 230 V).

System	CX1555	CX1555
Configuration	All (L/M/H)	All (L/M/H)
PSU Type	2 x 450W	2 x 450W
AC Input	120V	230V
Max. Amps.	4.1	3.4
Max. Watts	220	220
Typical Watts	175	180
Max VA	225	265
Power Factor	97	92
BTU (Typical)	605	610

Environmental Specifications

The following table summarizes the environmental requirements for the systems.

	CX1555
Operating Acoustic	61.6 dBA Sound Pressure (Typical)
Temperature (Operating)	10° - 40° C 50° - 104° F
Temperature (Storage)	-40° - 65° C -40° - 149° F
Relative Humidity	20% - 80% non-condensing
Storage Humidity	5% - 95% non-condensing

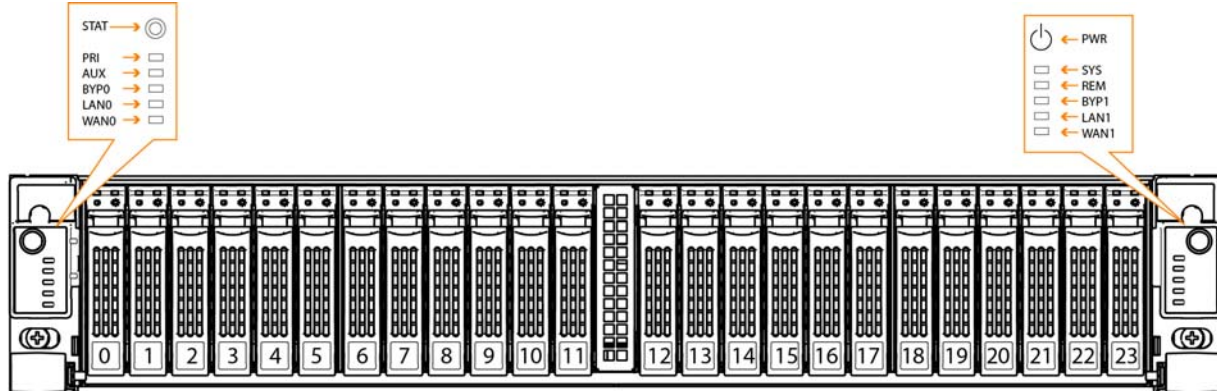
CX5055 and CX7055 Specifications

This section describes the status lights, ports, and technical and environmental specifications.

Status Lights and Ports

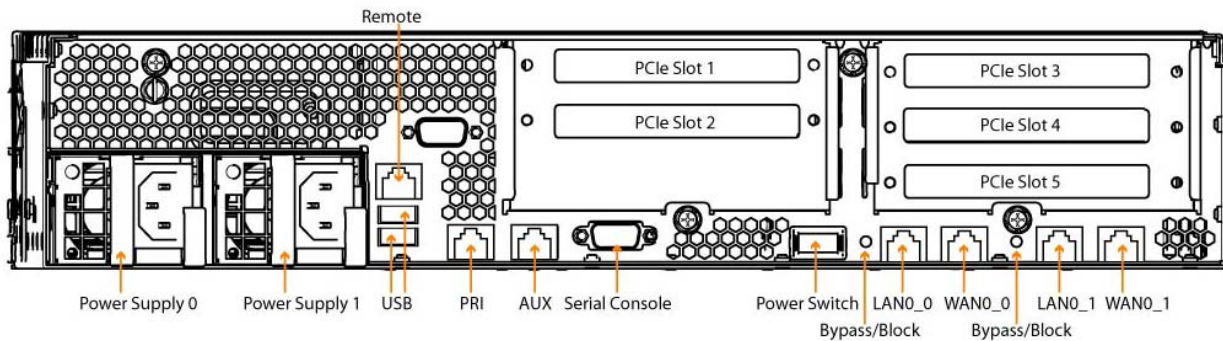
The following figure illustrates the status light and port locations.

Figure A-7. Front Panel



Disks 0 and 1 are HDD. Disks 2 through 23 are SSD.

Figure A-8. Back Panel



The following table summarizes the system LEDs.

LED	Status
SYSTEM	Normal = Blue System Boot = Yellow
PRI = Primary AUX = Auxiliary REM = Remote	Link and Traffic = Blinks Blue
LAN-WAN	Link and Traffic = Blinks Blue

LED	Status
BYP/BLK BYP = Bypass BLK = Block (Disconnect)	Normal = No Light Bypass or Block (Disconnect) = Orange
HDDs/SSDs	Activity LED Disk Connected = Blue Read/Write Activity = Blinks Blue Disk Fault LED Failed Disk = Orange
Back Panel PRI = Primary AUX = Auxiliary REM = Remote	Left LED Link = Green Activity = Blinks Green Right LED GB = Orange 100 MB = Green (REM only at 100 MB) 10 MB = No Light
Back Panel LAN-WAN	Left LED Link = Green Activity = Blinks Green Right LED GB = Orange 100 MB = Green 10 MB = No Light BYP/BLK Normal = No Light Bypass or Block (Disconnect) = Orange

Technical Specifications

The following table summarizes the technical specifications for the systems.

	CX5055 L/M	CX7055 L	CX7055 M	CX7055 H
Form Factor	2 U	2 U	2 U	2 U
Hard Disk/SSD	2 x 500 GB HDD	2 x 500 GB HDD	2 x 500 GB HDD	2 x 500 GB HDD
	8 x 80GB SSDs	10 x 160 GB SSDs	15 x 160 GB SSD	16 x 300 GB SSD
Data Store	640 GB SSD	1.6 TB SSD	2.4 TB SSD	4.8 TB SSD
Dimensions (LxWxH)	25.4x17.2x3.43 in	25.4x17.2x3.43 in	25.4x17.2x3.43 in	25.4x17.2x3.43 in
	645.4x436x87.1 mm	645.4x436x87.1 mm	645.4x436x87.1 mm	645.4x436x87.1 mm
Weight (without packaging)	52 lbs/ 23.6 kg	54 lbs/24.5 kg	54 lbs/ 24.5 kg	54 lbs/ 4.5 kg
Voltage Frequency	100-127V, 200-240V	100-127V, 200-240V	100-127V, 200-240V	100-127V, 200-240V
PSU	2 x	2 x	2 x	2 x
	770W	770W	770W	770W
	100-127Vac/8A, 50/60Hz	100-127Vac/8A, 50/60Hz	100-127Vac/8A, 50/60Hz	100-127Vac/8A, 50/60Hz
	200-240Vac/4A, 50/60Hz	200-240Vac/4A, 50/60Hz	200-240Vac/4A, 50/60Hz	200-240Vac/4A, 50/60Hz
PCI Slots	4	4	4	4
Onboard Bypass Ports/ Max # Ports	4/20	4/20	4/20	4/20

Power Requirements and Consumption

The following table summarizes the power specifications for the systems. The systems are rated at the following power characteristics when operating at nominal AC input voltages (120 V and 230 V).

System	CX5055	CX5055	CX7055	CX7055
Configuration	All (M/H)	All (M/H)	All (L/M/H)	All (L/M/H)
PSU Type	2 x 770W	2 x 770W	2 x 770W	2 x 770W
AC Input	120V	230V	120V	230V
Max. Amps.	4.9	2.5	5.3	2.8
Max. Watts	470	465	525	510
Typical Watts	375	375	420	410
Max VA	480	480	530	525
Power Factor	98	97	98	97
BTU (Typical)	1280	1275	1425	1390

Environmental Specifications

The following table summarizes the environmental requirements for the systems.

	CX5055	CX7055
Operating Acoustic	65.5 dBa Sound Pressure (Typical)	65.5 dBa Sound Pressure (Typical)
Temperature (Operating)	10° - 40° C 50° - 104° F	10° - 40° C 50° - 104° F
Temperature (Storage)	-40° - 65° C -40° - 149° F	-40° - 65° C -40° - 149° F
Relative Humidity	20% - 80% non-condensing	20% - 80% non-condensing
Storage Humidity	5% - 95% non-condensing	5% - 95% non-condensing

APPENDIX B Series xx50 Specifications

This appendix describes the status lights, ports, and the technical and environmental specifications for the Series xx50 systems. It includes the following sections:

- [“150, 250, and 550 Specifications” on page 71](#)
- [“1050 and 2050 Specifications” on page 74](#)
- [“5050 and 6050 Specifications” on page 77](#)
- [“7050 Specifications” on page 80](#)

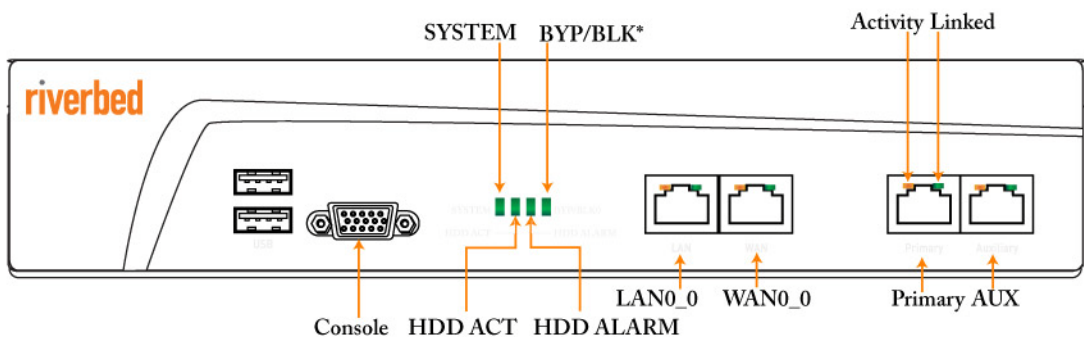
150, 250, and 550 Specifications

This section describes the status lights, ports, technical and environmental specifications.

Status Lights and Ports

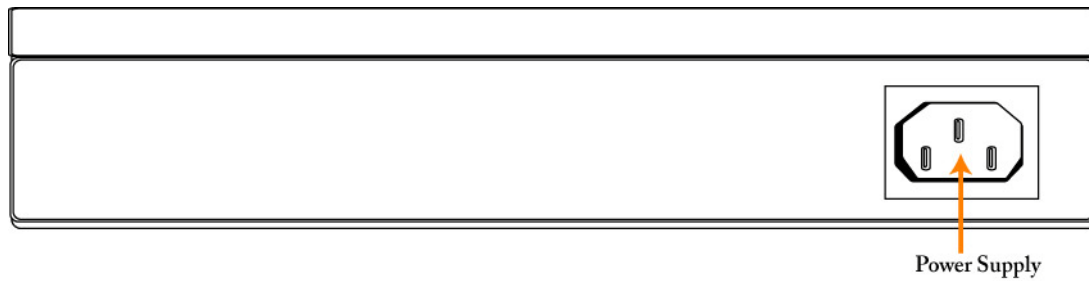
The following figure illustrates the status light and port locations.

Figure B-1. Front Panel



*Fail-to-Bypass (Bypass) and Fail-to-Block (Disconnect)

Figure B-2. Back Panel



The following table summarizes the system LEDs.

LED	Status
SYSTEM	Healthy = Blue Degraded = Yellow Critical = Red System Boot = Yellow Note: When the appliance is powered down with the power connected (for example, after running a reload halt command), the color of the system LED is undefined and carries no significance. The color can be either red, orange, or purple, depending on the state of the LED prior to shutdown.
HDD ACT	HDD Activity = Blinks Blue
BYP/BLK (Bypass or Block (Disconnect) Mode)	Normal = No Light Bypass or Block (Disconnect) = Orange
HDD ALARM	Disk Connected = Blue Read/Write Activity = Blinks Blue Failed Disk = Orange
LAN-WAN LEDs	Left LED Link = Green Activity = Blinks Green Right LED GB = Green 100-MB = Orange 10-MB = No Light

Technical Specifications

The following table summarizes the technical specifications for the systems.

	150 L/M/H	250 L/M/H	550 L/M/H
Form Factor	Desktop	Desktop	Desktop
Power (Typical)	62.5 W .514 A	62.5 W .514 A	62.5 W .514 A
VA (max)	62.5	62.5	62.5
BTU	213 BTU	213 BTU	227 BTU
Hard Disk	120 GB	120 GB	160 GB
Data Store	40 GB	40 GB	80 GB
Dimensions (LxWxH)	7.1x12x1.65 in 180.3x304.8x42 mm	7.1x12x1.65 in 180.3x304.8x42 mm	7.1x12x1.65 in 180.3x304.8x42 mm
Weight (without packaging)	4.12 lbs/2.15 kg	4.12 lbs/2.15 kg	4.12 lbs/2.15 kg
Voltage Frequency	100-127V, 200-240V	100-127V, 200-240V	100-127V, 200-240V
PSU	Single 100 W Internal 100-240Vac, 50/60Hz, 2-1 A	Single 100 W Internal 100-240Vac, 50/60Hz, 2-1 A	Single 100 W Internal 100-240Vac, 50/60Hz, 2-1 A
Onboard Bypass Ports/ Max # Ports	2/2	2/2	2/2

Note: Models 150, 250, and 550 do not support 64-bit VMs. The 64-bit guest VMs (such as, Windows Server 2008 R2) are not supported on the 150, 250, and 550 because these models do not incorporate VT support.

Environmental Specifications

The following table summarizes the environmental requirements for the systems.

	150, 250, 550
Temperature (Operating)	0° - 45° C 32° - 113° F
Temperature (Storage)	-40° - 65° C -40° - 149° F

150, 250, 550	
Relative Humidity	20% - 80% non-condensing
Storage Humidity	5% - 95% non-condensing
Operating Altitude	Up to 10,000 feet

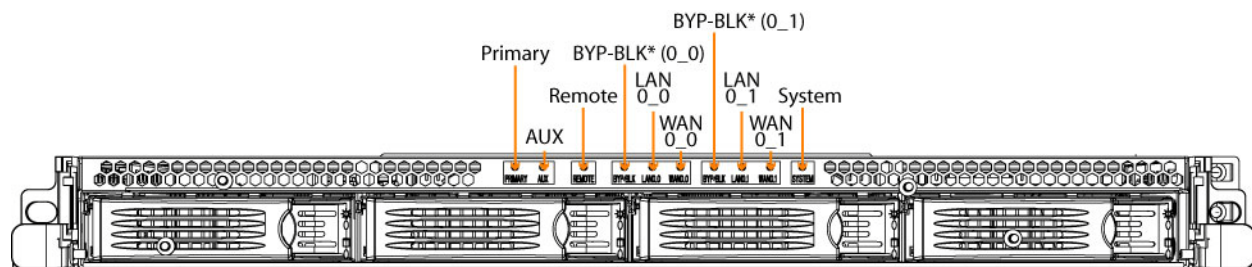
1050 and 2050 Specifications

This section describes the status lights, ports, technical and environmental specifications.

Status Lights and Ports

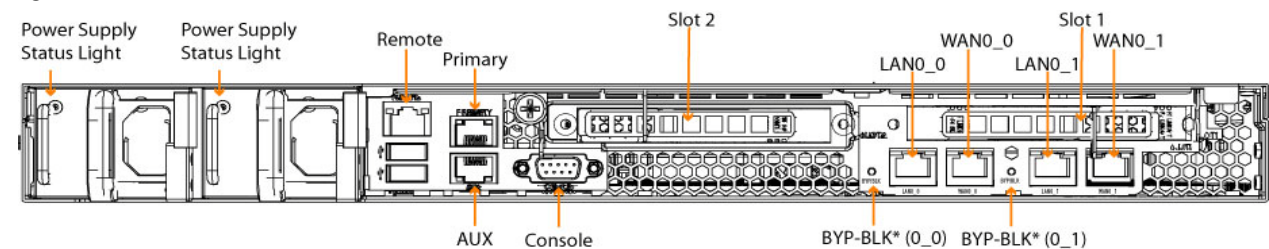
The following figure illustrates the status light and port locations.

Figure B-3. Front Panel



*Fail-to-Bypass (Bypass) and Fail-to-Block (Disconnect)

Figure B-4. Back Panel



*Fail-to-Bypass (Bypass) and Fail-to-Block (Disconnect)

The following table summarizes the system LEDs.

LED	Status
SYSTEM LEDs	Healthy = Blue Degraded = Yellow Critical = Red System Boot = Yellow
NETWORK STATUS LEDs (Front LAN-WAN LEDs)	Link = Blue Activity = Blinks Blue
BYP/BLK (Bypass or Block (Disconnect) Mode)	Normal = No Light Bypass or Block (Disconnect) = Orange
HDD LEDs	Disk Connected = Blue Read/Write Activity = Blinks Blue Failed Disk = Orange
LAN-WAN LEDs	Left LED Link = Green Activity = Blinks Green Right LED GB = Orange 100-MB = Green 10-MB = No Light

The following table summarizes the power supply LEDs.

LED	Condition
Solid Green	Healthy power supply with AC power connected.
Blinks Green	Unit is halted, but the power supplies are still connected to AC power.
Solid Orange	AC power is not connected to this power supply, but the unit is still powered on due to the other power supply. Occurs when the power supply automatically shuts off due to some error condition, such as an overheat.
Blinks Orange	Indicates a power supply predictive-fail condition, such as a fan failure. The power supply may then shut itself off, which changes the LED to solid orange. A log entry of this predictive-fail can be viewed using the show hardware error-log all command in the Riverbed Command-Line Interface.
No LED	No AC power connected.

Technical Specifications

The following table summarizes the technical specifications for the systems.

	1050 L/M/H	2050 L/M/H
Form Factor	1 U	1 U
Power (Typical)	138-151 W	197 W
	1.24-1.35 A	1.8 A
VA (max)	145-153	212
BTU	471-515 BTU	672 BTU
Hard Disk	250-500 GB	1 TB
	1-2 Hot Swappable Disks	4 Hot Swappable Disks
Data Store	100-200 GB	400 GB
Dimensions (LxWxH)	25.4 x 17.2 x 1.71 in	25.4 x 17.2 x 1.71 in
	645.4 x 436 x 43.5 mm	645.4 x 436 x 43.5 mm
Weight (without packaging)	29 lbs/13.1 kg	31.1 lbs/14.1 kg
	H=30 lbs 13.6 kg	
Voltage Frequency	100-127V, 200-240V	100-127V, 200-240V
PSU	1+1 Redundant	1+1 Redundant
	660 W	660 W
	100-127Vac/8A, 50/60Hz	100-127Vac/8A, 50/60Hz
	200-240Vac/4A, 50/60Hz	200-240Vac/4A, 50/60Hz
	-48Vdc, 8A	-48Vdc, 8A
PCI Slots	1	1
Onboard Bypass Ports/ Max # Ports	4/8	4/8

Note: Depth does not include bezel on 1U and 3U (approximately 1 inch or 2.5 cm).

Environmental Specifications

The following table summarizes the environmental requirements for the systems.

1050, 2050	
Temperature (Operating)	10° - 40°C 50° - 95°F
Temperature (Storage)	-40° - 65° C -40° - 149° F
Relative Humidity	20% - 80% non-condensing
Storage Humidity	5% - 95% non-condensing
Operating Altitude	Up to 10,000 feet

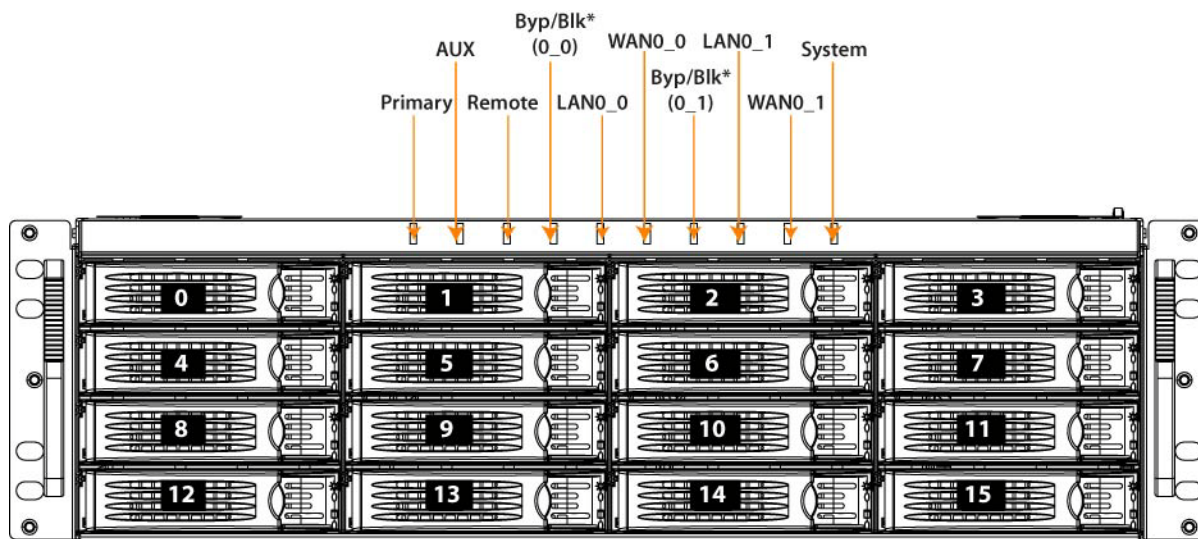
5050 and 6050 Specifications

This section describes the status lights, ports, technical and environmental specifications.

Status Lights and Ports

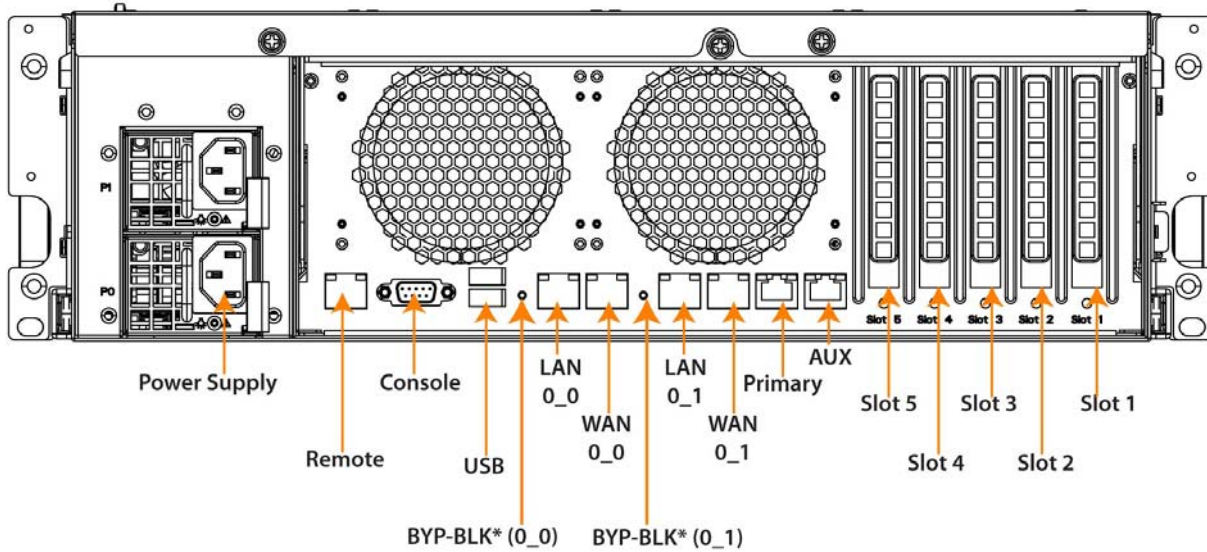
The following figure illustrates the status light and port locations.

Figure B-5. Front Panel



*Fail-to-Bypass (Bypass) and Fail-to-Block (Disconnect)

Figure B-6. Back Panel.



*Fail-to-Bypass (Bypass) and Fail-to-Block (Disconnect)

The following table summarizes the system LEDs.

LED	Status
SYSTEM LEDs	Healthy = Blue Degraded = Yellow Critical = Red System Boot = Yellow
NETWORK STATUS LEDs	Link = Blue Activity = Blinks Blue
BYP/BLK (Bypass or Block (Disconnect) Mode)	Normal = No Light Bypass or Block (Disconnect) = Orange
HDD LEDs	Disk Connected = Blue Read/Write Activity = Blinks Blue Failed Disk = Orange
LAN-WAN LEDs	Left LED Link = Green Activity = Blinks Green Right LED GB = Orange 100-MB = Green 10-MB = No Light

Technical Specifications

The following table summarizes the technical specifications for the systems.

	5050 L/M/H	6050 L/M/H
Form Factor	3 U	3 U
Power (Typical)	203-225 W	352 W
	2.73-3.15 A	4.9 A
VA (max)	325-335	452
BTU	693-768 BTU	1670 BTU
Hard Disk	2-3 TB	8 TB
	8-12 Hot Swappable Disks	16 Hot Swappable Disks
Data Store	600-800 GB	3.5 TB
Dimensions (LxWxH)	25.72 x 17.0 x 5.2 in	25.72 x 17.0 x 5.2 in
	653.4 x 431.6 x 131.9 mm	653.4 x 431.6 x 131.9 mm
Weight (without packaging)	59 lbs/26.7 kg	71 lbs/32.2 kg
	H= 64 lbs 29 kg	
Voltage Frequency	100-127V, 200-240V	100-127V, 200-240V
PSU	1+1 Redundant 770 W	1+1 Redundant 770 W
	100-127Vac/8A, 50/60Hz	100-127Vac/8A, 50/60Hz
	200-240Vac/4A, 50/60Hz	200-240Vac/4A, 50/60Hz
	-48Vdc, 8A	-48Vdc, 8A
PCI Slots	4	4
Onboard Bypass Ports/ Max # Ports	4/20	4/20

Environmental Specifications

The following table summarizes the environmental requirements for the systems.

	5050, 6050
Temperature (Operating)	10° - 40°C
	50° - 95°F
Temperature (Storage)	-40° - 65° C
	-40° - 149° F

5050, 6050	
Relative Humidity	20% - 80% non-condensing
Storage Humidity	5% - 95% non-condensing
Operating Altitude	Up to 10,000 feet

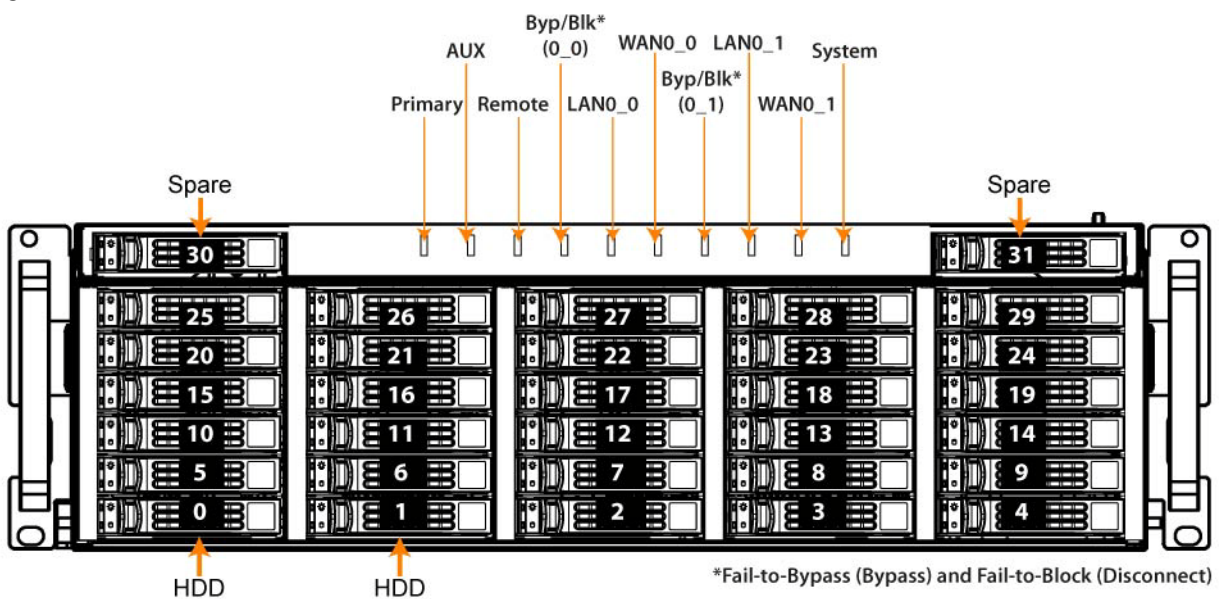
7050 Specifications

This section describes the status lights, ports, technical and environmental specifications.

Status Lights and Ports

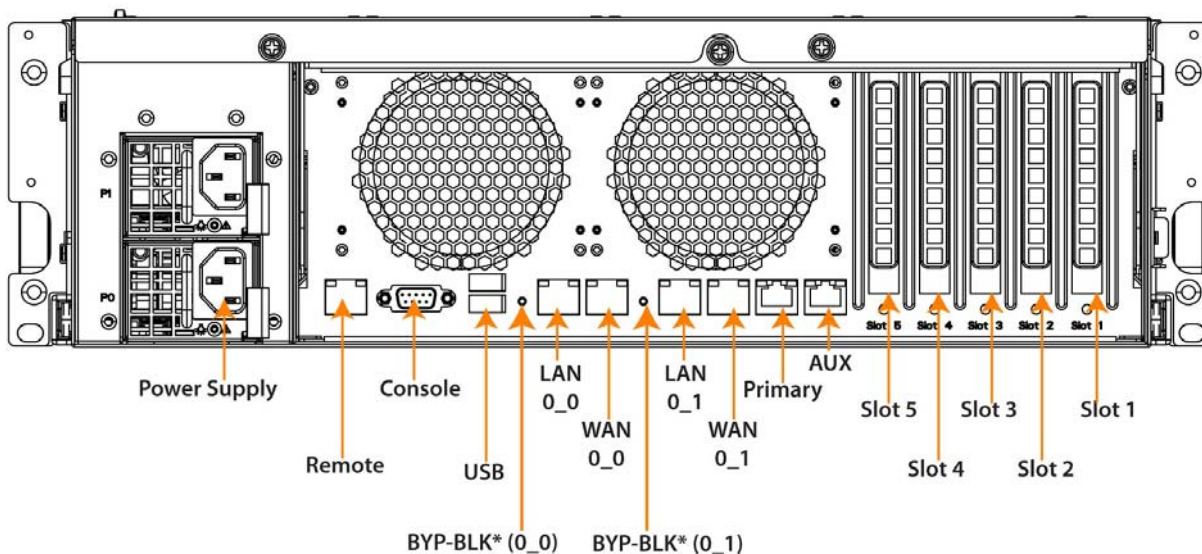
The following figure illustrates the status light and port locations.

Figure B-7. Front Panel



Disk drive numbers 0 and 1 are HDD. Drive numbers 2-29 are SSD.

Figure B-8. Back Panel



*Fail-to-Bypass (Bypass) and Fail-to-Block (Disconnect)

The following table summarizes the system LEDs.

LED	Status
SYSTEM LEDs	Healthy = Blue Degraded = Yellow Critical = Red System Boot = Yellow
NETWORK STATUS LEDs	Link = Blue Activity = Blinks Blue
BYP/BLK (Bypass or Block (Disconnect) Mode)	Normal = No Light Bypass or Block (Disconnect) = Orange
HDD LEDs	Disk Connected = Blue Read/Write Activity = Blinks Blue Failed Disk = Orange
LAN-WAN LEDs	Left LED Link = Green Activity = Blinks Green Right LED GB = Orange 100-MB = Green 10-MB = No Light

Technical Specifications

The following table summarizes the technical specifications for the systems.

7050 L/M/H	
Form Factor	3 U
Power (Typical)	425-430 W 4.2 A
VA (max)	455
BTU	1455-1470 BTU
Hard Disk	2.8-5.0 TB 2x 300GB 2.5" HDD 14--28x 160GB 2.5" SSD
Data Store	2.2-4.4 TB
Dimensions (LxWxH)	25.72 x 17.0 x 5.2 in 653.4 x 431.6 x 131.9 mm
Weight (without packaging)	55 lbs/ 25 kg M=59 lbs 25.8 kg
Voltage Frequency	100-127V, 200-240V
PSU	1+1 Redundant 770 W 100-127Vac/8A, 50/60Hz 200-240Vac/4A, 50/60Hz -48Vdc - -60Vdc, 12A
PCI Slots	4
Onboard Bypass Ports/ Max # Ports	4/20

Note: Depth does not include bezel on 1U and 3U (approximately 1 inch or 2.5 cm).

Environmental Specifications

The following table summarizes the environmental requirements for the systems.

7050	
Temperature (Operating)	0° - 45° C 32° - 113° F
Temperature (Storage)	-40° - 65° C -40° - 149° F
Relative Humidity	20% - 80% non-condensing
Storage Humidity	5% - 95% non-condensing
Operating Altitude	Up to 10,000 feet

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