

# **Sequence Reducer/Sequence Mirror Operator's Guide**

*For use with SR-15, SR-20, SR-50, SR-55, SR-80, SR-100, SM-250, and SM-500  
Peribit devices with SRS 5.0 software*



## Copyright

Sequence Reducer/Sequence Mirror Operator's Guide © 2001-2005 Peribit Networks, Inc. All Rights Reserved.

Peribit, the Peribit logo, PeriSphere, PeriScope, Molecular Sequence Reduction, MSR, Network Sequence Mirroring, NSM, Packet Flow Acceleration, PFA, Policy-Based Multipath, PBM, Sequence Reducer, SR, Sequence Mirror, SM, Sequence Reduction System, and SRS are trademarks or registered trademarks of Peribit Networks. All other products and services are trademarks, registered trademarks, service marks or registered service marks of their respective owners.

### U.S. GOVERNMENT RIGHTS

Use, duplication, or disclosure by the U.S. Government of any of the programs included in this product shipment is subject to restrictions set forth in the Peribit Networks, Inc. SOFTWARE LICENSE AGREEMENT AND LIMITED WARRANTY and as provided in DFARS 227.7202-1(a) and 227.7202-3(a) (1995), DRAS 252.227-7013(c)(ii) (OCT 1988), FAR 12.212(a)(1995), FAR 52.227-19, or FAR 52.227-14 (ALT III), as applicable. Peribit Networks, Inc.

This product includes a modified copy of the traceroute software developed by the University of California and its contributors. © 1990, 1993 The Regents of the University of California.

A copy of the University of California copyright notice, license terms and disclaimer is available in the *Sequence Reducer Operator's Guide* on page 389.

This product includes a modified version of OpenSSL. © 2001-2005 Peribit Networks, Inc. All Rights Reserved. © 1998-2000 The OpenSSL Project. © 1995-1998 Eric Young.

A copy of the Eric Young copyright notice, license terms and disclaimer is available in the *Sequence Reducer Operator's Guide* on page 390.

This product includes software developed by the OpenSSL Project for use in the OpenSSL Toolkit (<http://www.openssl.org>).

A copy of the OpenSSL Project copyright notice, license terms and disclaimer is available in the *Sequence Reducer Operator's Guide* on page 390.

This product contains a modified version of the IPsec software developed by the KAME Project.

A copy of the KAME copyright notice, license terms and disclaimer is available in the *Sequence Reducer Operator's Guide* on page 396.

This installation includes a modified version of ospfd. © 2001-2005 Peribit Networks, Inc. All Rights Reserved. ospfd © 1998 John T. Moy. You may find a copy of the modified source code at [www.peribit.com/opensource/ospfd.zip](http://www.peribit.com/opensource/ospfd.zip).

ospfd is free software; you can redistribute it and/or modify it under the terms of the GNU General Public License as published by the Free Software Foundation; either version 2 of the License, or (at your option) any later version.

This program is distributed in the hope that it will be useful, but WITHOUT ANY WARRANTY; without even the implied warranty of MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE. You may obtain a copy of the GNU General Public License at [www.peribit.com/opensource/gpl.zip](http://www.peribit.com/opensource/gpl.zip). Or write to the Free Software Foundation, Inc., 59 Temple Place - Suite 330, Boston, MA 02111-1307, USA.

A log of modifications made to the ospfd source code is available at [www.peribit.com/opensource/ospfd.zip](http://www.peribit.com/opensource/ospfd.zip).

Part number 100068 Rev. 013A

Peribit Networks, Inc.  
2300 Central Expressway  
Santa Clara, CA 95050  
Phone: 1-866-Peribit  
408-330-5600  
Fax: 408-330-5601  
Email: [info@peribit.com](mailto:info@peribit.com)  
Web: <http://www.peribit.com>

# Contents

---

<b>Preface</b> .....	<b>11</b>
Audience .....	11
Package Contents .....	11
Operator's Guide Contents .....	12
Document Conventions .....	13
Commonly Used Terms .....	13
Typographical Conventions .....	14
Technical Support .....	14
Obtaining Additional Product Information .....	14
<b>Chapter 1 Introduction</b> .....	<b>15</b>
About the Peribit Devices .....	15
Features and Benefits .....	16
What's New in Version 5.0 .....	17
Sample Topologies .....	18
Typical Inline Deployment .....	18
Off-Path Deployment .....	19
Point-to-Multipoint Topology .....	19
Virtual Private Network (VPN) Topology .....	20
Multi-Node Configuration .....	20
Basic Concepts .....	21
Peribit Communities and Registration Servers .....	21
Reduction Tunnels .....	22
Local Routes and Reduction Subnets .....	23
Remote Routes .....	23
Community Topologies .....	24
High Availability Support .....	24
Peribit Profile Mode .....	25
PeriScope Central Management System (CMS) .....	25
Where to Go Next .....	25
<b>Chapter 2 Installation</b> .....	<b>27</b>
Before You Begin .....	27
Battery Warning .....	28
Manual and Automatic Installations .....	28
Inline and Off-path Installations .....	28
Interface Speeds and Modes .....	29
Installing the SR-15, SR-20, and SM-250 .....	29
SR-15, SR-20, and SM-250 Hardware Installation .....	29
Configuring Network Settings for the SR-15, SR-20, and SM-250 .....	31
Installing the SR-50 and SR-55 Sequence Reducer .....	34

SR-50 and SR-55 Hardware Installation . . . . .	34
Configuring Network Settings for the SR-50 and SR-55 . . . . .	36
Installing the SR-80 and SR-100 Sequence Reducer . . . . .	38
SR-80 and SR-100 Hardware Installation . . . . .	38
Copper-wire Interfaces . . . . .	39
Fiber-optic Interfaces . . . . .	40
Configuring Network Settings for the SR-80 and SR-100 . . . . .	40
Connecting Client Devices to the SR-100 . . . . .	43
Disconnecting Client Devices from the SR-100 . . . . .	44
Installing the SM-500 Sequence Mirror . . . . .	45
SM--500 Hardware Installation . . . . .	45
Configuring Network Settings for the SM-500 . . . . .	47
Running Quick Setup through the Web Console . . . . .	48
Post-Installation Tasks . . . . .	56
Where to Go Next . . . . .	56
<b>Chapter 3 Configuring Basic Setup Policies . . . . .</b>	<b>57</b>
Using the Web Console . . . . .	57
Logging In to a Peribit Device . . . . .	57
Understanding the SRS Web Console Interface . . . . .	58
Using Special Characters . . . . .	58
Configuring Basic Setup Policies . . . . .	59
Configuring Device Address and Contact Information . . . . .	59
Configuring the Interface Settings . . . . .	60
Configuring 802.1Q VLAN Support . . . . .	62
Configuring Time Settings . . . . .	63
Entering a Permanent License Key . . . . .	64
Enabling SNMP . . . . .	65
Enabling Syslog Reporting . . . . .	66
Configuring Local Routes . . . . .	67
Adding Static Routes . . . . .	69
Enabling RIP and OSPF Support . . . . .	70
Enabling Route Polling . . . . .	71
Importing a Routing Table from an FTP Server . . . . .	72
Enabling Route-Based Router Balancing . . . . .	74
Configuring Registration Servers and Communities . . . . .	76
Defining Registration Servers and Passwords . . . . .	76
Defining Communities . . . . .	78
Configuring AAA . . . . .	80
Selecting Authentication Methods . . . . .	81
Enabling Authorization Checking . . . . .	83
Defining RADIUS Servers and Server Groups . . . . .	84
Defining Local Users . . . . .	85
Securing Operator Access . . . . .	87

Securing Front Panel Access . . . . .	88
Changing the Packet Capture Password . . . . .	89
Managing Applications. . . . .	90
Configuring Application Definitions . . . . .	92
Testing New Application Definitions . . . . .	95
<b>Chapter 4 Configuring Advanced Setup Policies . . . . .</b>	<b>97</b>
Setting Community Topology Parameters . . . . .	97
Filtering Data Reduction by Source and Destination . . . . .	100
Configuring the ARP Table . . . . .	102
Defining the Prime Time . . . . .	103
Configuring Packet Interception. . . . .	104
Configuring Packet Interception for Off-Path Peribit Devices . . . . .	104
RIP Router/Switch Configuration Commands. . . . .	107
Single Layer 3 Switch. . . . .	107
Dual Off-Path Devices on Two Layer 3 Switches . . . . .	108
WCCP Router Configuration Commands . . . . .	109
External Policy-Based Router Commands. . . . .	110
Alternatives to Packet Interception . . . . .	111
Layer 2 Switch Sandwich . . . . .	111
Layer 3 Switch Sandwich . . . . .	112
Configuring Policy-Based Multi-Path . . . . .	113
Procedure for Configuring Multi-Path. . . . .	114
Enabling Multi-Path and Defining Marking Methods . . . . .	115
Defining Multi-Path Templates . . . . .	117
Defining Multi-Path Endpoints . . . . .	119
Configuring Routers to Support Multi-Path . . . . .	121
<b>Chapter 5 Configuring Reduction Policies . . . . .</b>	<b>123</b>
Configuring Basic Reduction Policies . . . . .	123
Configuring Endpoints for Reduction Tunnels . . . . .	123
Advertising Reduction Subnets . . . . .	126
Configuring Network Sequence Mirroring . . . . .	128
Reducing and Monitoring Applications. . . . .	130
Configuring Advanced Reduction Policies. . . . .	131
Viewing and Fetching Remote Routes . . . . .	132
Configuring Load Balancing Policies . . . . .	133
Defining Default Assemblers. . . . .	135
Defining Preferred Assemblers . . . . .	137
Configuring Tunnel Mode Settings . . . . .	138
Configuring Pre-Synchronization for Network Sequence Mirroring . . . . .	139
Configuring Tunnel Switching in Hierarchical Deployments . . . . .	141
Tunnel Switching Between Communities. . . . .	142
Procedure for Configuring Tunnel Switching Between Communities . . . . .	143
Tunnel Switching Between Hub and Spoke Devices . . . . .	143

<b>Chapter 6 Applying Quality of Service (QoS) Policies.....</b>	<b>145</b>
Using Outbound QoS to Enhance Performance .....	145
Understanding Outbound Bandwidth Management .....	146
Traffic Classes and Bandwidths.....	147
QoS Templates and Endpoints.....	147
WAN Circuit Speeds and Router Overhead .....	148
Dedicated and Oversubscribed WANs .....	149
Direct Setup Versus Wizard Configuration Results .....	150
Class Priorities and Excess Bandwidth Allocation .....	152
ToS/DSCP Prioritization .....	153
Unadvertised Subnets.....	153
Configuring Outbound QoS Policies .....	153
Procedure for Configuring Outbound QoS Policies .....	154
Using the Outbound QoS Setup Wizard .....	155
Defining Outbound QoS Settings by Endpoint .....	161
Defining Traffic Classes .....	163
Defining Outbound QoS Templates.....	164
Defining Outbound QoS Endpoints.....	166
Changing Outbound ToS/DSCP Values .....	170
Starting and Stopping Outbound QoS .....	172
Configuring Inbound QoS Policies.....	173
Summary of Key Terms.....	175
<b>Chapter 7 Configuring Packet Flow Acceleration .....</b>	<b>177</b>
Overview of Packet Flow Acceleration .....	177
Flow Pipelining .....	177
Fast Connection Setup .....	179
Active Flow Pipelining .....	180
Forward Error Correction .....	181
Requirements for Using Packet Flow Acceleration .....	181
Defining Outbound QoS Settings for PFA.....	182
Enabling Packet Flow Acceleration by Endpoint.....	182
Enabling Packet Flow Acceleration by Application.....	185
Enabling Flow Pipelining by Application .....	186
Enabling Fast Connection Setup by Application.....	187
Enabling Active Flow Pipelining by Application .....	188

<b>Chapter 8 Configuring IP Security (IPSec)</b>	<b>189</b>
Overview of IPSec	189
Default IPSec Policy	189
IPSec Implementation Details	190
Procedure for Configuring IPSec Policies	190
Using the IPSec Setup Wizard	191
Defining IPSec Settings by Endpoint	195
Defining IPSec Templates	197
Defining the Default IPSec Policy	199
<b>Chapter 9 Viewing Results</b>	<b>201</b>
Viewing and Printing Reports	201
Reduction Statistics	202
Throughput Statistics	202
Data Reduction Statistics	204
Application Summary Statistics	207
Passthrough Statistics	209
Packet Size Distribution Statistics	211
Multi-Path Performance	212
Outbound Bandwidth Statistics	214
Inbound Bandwidth Statistics	215
Application Acceleration Statistics	217
Flow Pipelining and Active Flow Pipelining Statistics	217
Fast Connection Setup Statistics	219
Forward Error Correction Statistics	221
Viewing and Exporting Top Traffic Statistics	222
Endpoints Summary	224
<b>Chapter 10 Maintaining Peribit Devices</b>	<b>227</b>
Maintaining Configurations and Software	227
Saving the Device Configuration	227
Displaying the Running Configuration	229
Loading a Device Configuration File	230
Loading a Boot Image	231
Clearing Application Monitoring Statistics	232
Setting the Device to the Factory Default Configuration	232
Rebooting the Device	234
Using Maintenance Tools	234
Pinging a Network Device	235
Running a Traceroute to a Network Device	236
Running a Packet Capture	237
Generating NetFlow Records	238
Entering CLI Commands from the Web Console	239
Viewing and Saving System Logs	240

Viewing and Saving the Access Control Log .....	241
Exporting Performance Data .....	242
Creating a Diagnostic File .....	243
Viewing the SR-100 Server/Client Summary .....	244
<b>Chapter 11 Using the Command Line Interface (CLI) .....</b>	<b>245</b>
Accessing the CLI. ....	245
Using a Secure Shell Program from a Remote Workstation .....	245
Using a Terminal Connected to the Serial Port .....	246
Logging In Using the CLI. ....	246
CLI Basics. ....	247
Command Modes .....	248
CLI Show Commands. ....	248
Top-Level CLI Commands. ....	250
Commit Command. ....	250
Configure Command .....	250
Import Route Table Command .....	251
Load Config Command .....	251
Packet Capture Command .....	252
Ping Command. ....	253
Reboot Command .....	254
Rollback Command .....	255
Save Config Command .....	255
Set Command. ....	256
Shutdown Command .....	256
Source Command. ....	256
Support Command .....	257
Traceroute Command. ....	257
Upgrade Command .....	257
Viewing System and Access Control Log Files .....	258
File Management Commands. ....	258
Copy Command .....	258
List Command .....	259
Remove Command. ....	259
CLI Configuration Commands .....	259
Configure AAA Command .....	260
Configure Acceleration Command .....	262
Configure Application Command .....	265
Configure ARP Command. ....	267
Configure Backup Command .....	268
Configure Clock Command .....	269
Configure Console Command .....	269
Configure Filter Command .....	270
Configure Interface Command .....	271



Configure IP Command . . . . .	273
Configure IPsec Command . . . . .	273
Configure License Command . . . . .	276
Configure Monitored Applications Command . . . . .	277
Configure Multi-Node Command . . . . .	277
Configure Multi-Path Command . . . . .	278
Configure OSPF Command . . . . .	281
Configure Packet Interception Command . . . . .	282
Configure Prime-Time Command . . . . .	284
Configure Profile Mode Command . . . . .	284
Configure QoS Inbound Command . . . . .	285
Configure QoS Outbound Command . . . . .	287
Configure RADIUS Command . . . . .	292
Configure Reduction Command . . . . .	293
Configure Reduction Subnets Command . . . . .	301
Configure Registration Server Command . . . . .	303
Configure Remote Routes Command . . . . .	304
Configure RIP Command . . . . .	305
Configure Route Command . . . . .	306
Configure Route Poll Command . . . . .	308
Configure Security Command . . . . .	309
Configure SNMP Command . . . . .	310
Configure SNTP Command . . . . .	311
Configure Stack-Group Command . . . . .	311
Configure Syslog Command . . . . .	312
Configure Top Talker Command . . . . .	313
<b>Appendix A Multi-Node Configurations . . . . .</b>	<b>315</b>
About Multi-Node Configuration . . . . .	315
Before You Begin . . . . .	316
Installing Two Peribit Devices in Multi-Node Configuration . . . . .	316
Hardware Installation for Multi-Node Configuration . . . . .	317
Configuring Network Settings for Multi-Node Configuration . . . . .	319
Running Quick Setup for Multi-Node Configuration . . . . .	321
Displaying the Status of Multi-Node Configuration . . . . .	324
<b>Appendix B Peribit Device Specifications . . . . .</b>	<b>325</b>
SR-15 Specifications . . . . .	325
SR-20 Specifications . . . . .	327
SR-50 and SR-55 Specifications . . . . .	329
SR-80 and SR-100 Specifications . . . . .	331
SM-250 Specifications . . . . .	333
SM-500 Specifications . . . . .	335
DB9 Console Port Pin-Outs . . . . .	337

<b>Appendix C</b>	<b>SNMP Traps and Syslog Messages.....</b>	<b>339</b>
	SNMP Traps .....	339
	Syslog Messages .....	342
<b>Appendix D</b>	<b>Understanding Exported Data Results.....</b>	<b>349</b>
	NetFlow Version 5 Export .....	349
	Performance Statistics Export.....	350
	General Device Information .....	351
	System Session Statistics .....	351
	Reduction Session Statistics .....	353
	Application Session Statistics .....	354
	Bandwidth Management Statistics.....	355
	Inbound Traffic By Port Statistics .....	356
<b>Appendix E</b>	<b>Common Application Port Numbers .....</b>	<b>357</b>
<b>Appendix F</b>	<b>Peribit Profile Mode.....</b>	<b>359</b>
	About Peribit Profile Mode.....	359
	Purpose and Benefits .....	359
	Sample Topology.....	360
	Security .....	360
	Peribit's Return on Investment.....	360
	Pre-Installation Tasks .....	361
	Installing an SR-15 or SR-20 in Profile Mode .....	362
	Hardware Installation.....	362
	Configuring Network Settings .....	363
	Installing an SR-5x, SR-80, SR-100, or SM-500 in Profile Mode.....	365
	Hardware Installation.....	365
	Configuring Network Settings .....	366
	Configuring Profile Mode through the Web Console.....	367
	Running Quick Setup .....	367
	Defining Virtual Peribit Devices in Profile Mode.....	370
	Excluding Traffic to the Local Subnet.....	372
	Viewing Performance Reports .....	372
	Exporting Performance Data .....	374
	Converting from Profile Mode to Inline Mode.....	375
	<b>Glossary.....</b>	<b>377</b>
	<b>Index.....</b>	<b>381</b>

# Preface

---

Welcome to the operator's guide for the Peribit® SR-15™, SR-20™, SR-50™, SR-55™, SR-80™, SR-100™, and SM-500™ Peribit devices. With its patent-pending Molecular Sequence Reduction™ (MSR) and Network Sequence Mirroring™ (NSM) technologies, the Peribit devices provide instant WAN capacity to your existing network.

This section describes the audience, organization, and typographical conventions used in this manual.

## Audience

This manual is intended for administrators responsible for configuring and managing Peribit devices. It is assumed that readers of this manual are familiar with their network architecture and devices, and can perform basic network configuration procedures.

## Package Contents

Peribit devices are shipped with the following:

- 1 Peribit SR-15, SR-20, SR-50, SR-55, SR-80, SR-100, or SM-500
- 1 Female/female DB-9 crossover cable (SR-15 and SR-20 only)
- 2 Rack-mount flanges for rack mount installation
- 6 Screws for the rack-mount flanges (SR-50, SR-55, SR-80, and SR-100)
- 4 Screws for the rack-mount flanges (SR-15 and SR-20)
- 4 Rubber feet for desktop placement (already assembled on SR-15)
- 1 Power Cord (two for SR-80 and SR-100)
- 1 Quick Start Card
- 1 Documentation/Utilities CD
- 1 Release notes document

---

**IMPORTANT:** Peribit has designed special packaging material to protect SM-500 systems during shipping. Retain the packing material in case the unit needs to be shipped again for any reason. Shipping the unit without the original Peribit packaging material will void the warranty.

---

## Operator's Guide Contents

- **Chapter 1, "Introduction"**

This chapter introduces the Peribit devices, describes the new features, and provides sample topologies for deployment.

- **Chapter 2, "Installation"**

This chapter describes how to install and initially configure a Peribit device.

- **Chapter 3, "Configuring Basic Setup Policies"**

This chapter describes how to configure basic policies through the Web console, such as IP parameters, security settings, and discovery of local routes.

- **Chapter 4, "Configuring Advanced Setup Policies"**

This chapter describes how to configure advanced policies, such as topology parameters, packet interception, and Policy-Based Multi-Path™ (PBM).

- **Chapter 5, "Configuring Reduction Policies"**

This chapter describes how to configure policy settings for data reduction, and the communication links with other devices in the Peribit Community.

- **Chapter 6, "Applying Quality of Service (QoS) Policies"**

This chapter describes how to configure outbound and inbound Quality of Service (QoS) policy settings, including traffic classes, WAN circuit speeds, and guaranteed bandwidths.

- **Chapter 7, "Configuring Packet Flow Acceleration"**

This chapter describes how to configure Packet Flow Acceleration™ (PFA) for TCP applications.

- **Chapter 8, "Configuring IP Security (IPSec)"**

This chapter describes how to configure IPSec to encrypt the traffic between two Peribit devices.

- **Chapter 9, "Viewing Results"**

This chapter describes the detailed graphs and reports that you use to monitor device performance.

- **Chapter 10, "Maintaining Peribit Devices"**

This chapter describes how to maintain and manage the Peribit devices, and covers topics such as saving configuration files and displaying system log files.

- **Chapter 11, "Using the Command Line Interface (CLI)"**

This chapter describes how to set up and configure the Peribit device using the Command Line Interface (CLI).

- **Appendix A, "Multi-Node Configurations"**

This appendix describes how to install two SR-50, SR-55, or SR-80 in Multi-Node configuration.

- **Appendix B, “Peribit Device Specifications”**

This appendix lists the specifications for each type of Peribit device.

- **Appendix C, “SNMP Traps and Syslog Messages”**

This appendix describes SNMP Trap and Syslog messages generated by the Peribit devices.

- **Appendix D, “Understanding Exported Data Results”**

This appendix describes the details of exported data results. After exporting the reduction statistics to a comma-separated values file, use this appendix to interpret the data.

- **Appendix E, “Common Application Port Numbers”**

This appendix provides a listing of common application port numbers that you can use when defining new applications.

- **Appendix F, “Peribit Profile Mode”**

This appendix describes how to configure Peribit Profile Mode (PPM) to test the performance of a Peribit device without affecting the network traffic.

- **“Glossary”**

The glossary provides definitions of terms used throughout this manual.

## Document Conventions

This section describes conventions used throughout this manual.

### Commonly Used Terms

Peribit devices can be configured through a Graphical User Interface (GUI) Web console or Command Line Interface (CLI). When referring to these configuration methods, the following terminology is used:

- **Web console** — Web-based console.
- **CLI** — Command Line Interface.

## Typographical Conventions

Table 1 lists the typographical conventions used throughout this manual.

**Table 1** Typographical Conventions

Convention	Meaning	Example
<b>boldface</b>	Names of buttons or keys you should press.	Click <b>Submit</b> .
<code>courier font</code>	Text that you enter from your keyboard.	Enter the following command: <code>a:\setup</code>
Angle brackets	Encloses variables that you must substitute another value for.	set ip <IP address>
Square brackets	Encloses optional parameters.	show log [<n>]
Curved brackets	Encloses related parameters.	set mode {on   off}
<i>italics</i>	Names of manuals, directories, files, or Uniform Resource Locators (URLs).	The address of Peribit's web site is <i><a href="http://www.peribit.com">http://www.peribit.com</a></i> .

## Technical Support

Peribit's commitment to create products and services that enable our customers success is reflected in our Technical Assistance Center (TAC), and our comprehensive support programs.

For technical support with Peribit products, use the following methods:

- Our Customer Support Extranet:
  - a. Go to <http://www.peribit.com/support>
  - b. Click **Customer login**.
  - c. Enter your user name and password.

If you have not received your user name and password, please send email to [support@peribit.com](mailto:support@peribit.com).

- Our toll-free telephone support line:
 

Call +1-866-Peribit (+1-866-737-4248), or +1-408-330-5600 and follow the prompt for Peribit Support.

## Obtaining Additional Product Information

In addition to this operator's guide, a printed Quick Start card and a copy of the Release Notes are enclosed with each Peribit device. Refer to the Quick Start card for product installation instructions, and the Release Notes for the latest product information.

For additional product information, please visit our web site at <http://www.peribit.com>.

# Chapter 1 Introduction

---

The following sections provide an overview of the Peribit devices, including a description of the new features in this release:

- [“About the Peribit Devices” in the next section](#)
- [“Features and Benefits” on page 16](#)
- [“What’s New in Version 5.0” on page 17](#)
- [“Sample Topologies” on page 18](#)
- [“Basic Concepts” on page 21](#)
- [“PeriScope Central Management System \(CMS\)” on page 25](#)

## About the Peribit Devices

The Peribit devices are LAN-based network devices that enhance the throughput of WAN circuits by addressing the three constraints on WAN performance—bandwidth, latency, and application contention. Installed on each side of a WAN circuit, the Peribit devices use the following technologies to compress, accelerate, and manage WAN traffic:

- **Molecular Sequence Reduction (MSR).** Based on algorithms used to find repeating patterns in DNA molecules, MSR locates repeated data patterns at the byte level, in real time, across all IP application sessions. Repeated patterns are sent as symbols, which the receiving Peribit device assembles (restores) from a shared dictionary. The reduction in traffic effectively increases the WAN bandwidth, reduces network congestion, and improves overall data flow.
- **Network Sequence Mirroring (NSM).** An enhanced disk-based version of MSR available between Peribit Sequence Mirror (SM) devices. NSM uses disk storage to identify longer patterns of repeated traffic, and to retain those patterns for longer periods of time (even when a reduction tunnel is down). NSM is most effective where large files are often sent over the WAN, such as for database backups.
- **Quality of Service (QoS).** Application contention for available WAN bandwidth can be tightly controlled by assigning applications to traffic classes, and setting guaranteed and maximum bandwidths for each class. Class priorities can be set to ensure that time-sensitive applications, like VoIP, receive a sufficient amount of bandwidth. Peribit devices can also honor and set the ToS/DSCP values used by QoS devices in your network.
- **Packet Flow Acceleration (PFA).** While MSR effectively increases available bandwidth, PFA provides several methods to improve TCP application performance in networks where the use of available bandwidth is constrained by network latency.
- **Policy-Based Multi-Path (PBM).** Directs traffic to one of two paths based on the performance needs of an application and the performance of the path. When loss and/or latency exceed the specified thresholds, traffic can be directed to the alternate path.
- **Encryption.** IPSec encryption can be enabled on specific paths to protect traffic in environments that are not secure (such as the Internet and satellite links).

The various Peribit devices support Ethernet speeds up to 1 Gbps, and can process IP WAN traffic up to 45 Mbps (T3 speeds). Higher WAN speeds (up to OC-3/STM-1) can be supported by connecting client devices to the SR-100 (stack-group configuration).

You can monitor and manage Peribit devices through a secure Web console, a command line interface (CLI), or the PeriScope™ Central Management System (CMS). You can also monitor device performance through an SNMP-based management system. For the specifications of each type of device, refer to [“Peribit Device Specifications” on page 325](#).

## Features and Benefits

Peribit devices enable networks to achieve maximum capacity over wide-area network (WAN) links. The primary features and benefits include:

- **Substantial throughput gain** — Greatly improves WAN capacity, accelerates TCP applications in high-latency environments, and reduces the load on other network devices.
- **Scalable** — Supports aggregation of remote devices at a central point.
- **Immediate impact** — Gains are realized immediately when Peribit devices are installed in the network. No time-consuming build-out.
- **Transparent** — Operates transparently to existing network equipment, topologies, and WAN interfaces (such as Frame Relay, ATM). No network or application modifications are required.
- **Application independent** — Works on any application over IP (such as e-mail, database, Web, ERP, and so on). Uses open standard protocols.
- **QoS Interoperable** — Honors, retains, and sets QoS priority levels within your network. Can maintain application visibility for data flows, enabling WAN probes and WFQ to work effectively.
- **Intelligent Bandwidth Management** — Can allocate operator-defined bandwidth ranges by traffic classes for greater control of newly created bandwidth.
- **Failsafe non-stop operation** — Switch-to-wire on any hardware or software disruption, including power loss. A single Peribit device can be installed as a backup for multiple primary devices.
- **Easily managed** — Administrative access through an intuitive Web user interface (SSL), a command line interface (CLI) using SSH. Users can be authenticated and authorized locally or through a RADIUS server.
- **VPN and firewall friendly** — Peribit devices installed on the LAN side of encryption devices work seamlessly with VPNs and firewalls.
- **Secure** — Provides confidentiality and message integrity for WAN traffic.



## What's New in Version 5.0

SRS 5.0 includes the following new features:

Feature	Description	Benefit
<b>SR-15</b>	<ul style="list-style-type: none"> <li>Provides compressed throughput from 64 Kbps to 1 Mbps</li> <li>Connects to 2 Peribit devices, and supports 2 virtual QoS endpoints, 1000 routes, and 100 application definitions</li> </ul>	<ul style="list-style-type: none"> <li>Provides cost-effective WAN optimization for low-speed WAN links to branch offices</li> </ul>
<b>SM-500</b>	<ul style="list-style-type: none"> <li>First in Sequence Mirror product family</li> <li>Dual hard disk drives support Network Sequence Mirroring (NSM)</li> <li>Provides compressed throughput from 256 Kbps to 20 Mbps</li> </ul>	<ul style="list-style-type: none"> <li>Provides enhanced data reduction</li> <li>Particularly effective for large data transfers and database backups</li> </ul>
<b>SR-100</b>	<ul style="list-style-type: none"> <li>Newest member of SR product family</li> <li>Provides compressed throughput from 1 Mbps to 155 Mbps</li> <li>Connects to as many as 2000 Peribit devices</li> </ul>	<ul style="list-style-type: none"> <li>Enables high-performance reduction on high-capacity WAN links</li> <li>Enables scaled connectivity for large hub locations</li> </ul>
<b>Active Flow Pipelining (AFP)</b>	<ul style="list-style-type: none"> <li>Terminates TCP locally and uses reliable transport between Peribit devices</li> <li>Increases TCP throughput for high-latency or high-bandwidth connections constrained by TCP ACKs</li> </ul>	<ul style="list-style-type: none"> <li>Increases throughput even when bandwidth is not a limiting factor</li> <li>Especially helpful on satellite or inter-continental links</li> <li>Very beneficial for large file transfers, such as for replication, multimedia, and data center recovery</li> </ul>
<b>Forward Error Correction (FEC)</b>	<ul style="list-style-type: none"> <li>Sends recovery packets with data packets</li> </ul>	<ul style="list-style-type: none"> <li>Transparently and automatically recovers dropped TCP packets on lossy links, avoiding retransmission</li> <li>Maintains high TCP throughput even under packet-loss conditions</li> </ul>
<b>Policy-Based Multi-Path</b>	<ul style="list-style-type: none"> <li>At sites with dual WAN links, IT can define primary and secondary tunnels and set policy for redirecting applications</li> <li>Failover triggered by tunnel failure or latency and packet loss</li> <li>Both paths can be active simultaneously</li> </ul>	<ul style="list-style-type: none"> <li>Allows IT to balance traffic across diverse WAN connections, such as private Frame Relay and Internet/DSL</li> <li>Enforces business policies for application delivery</li> </ul>
<b>QoS to any WAN Destination</b>	<ul style="list-style-type: none"> <li>Allows bandwidth management to be applied to remote subnets that do not have a Peribit device</li> </ul>	<ul style="list-style-type: none"> <li>Allows IT to define outbound QoS on the entire network</li> </ul>
<b>Automated Deployment</b>	<ul style="list-style-type: none"> <li>Provides for fully automated remote Peribit installations</li> <li>Automatically downloads proper image and configuration</li> <li>Uses combination of SRS and CMS 5.0</li> </ul>	<ul style="list-style-type: none"> <li>No remote IT staff required for deployments</li> <li>Simplifies installation cost and time</li> </ul>
<b>Tunnel Switching</b>	<ul style="list-style-type: none"> <li>Supports end-to-end tunneling through intermediate tunnels and multiple communities</li> <li>Supports hierarchical tunnel deployment</li> </ul>	<ul style="list-style-type: none"> <li>Enables any-to-any communications between Peribit locations without requiring fully meshed tunnels</li> </ul>

Feature	Description	Benefit
<b>Visibility and Performance Reporting</b>	<ul style="list-style-type: none"> <li>Multi-Path reports show end-to-end latency and loss</li> <li>Endpoint reports show active tunnel features</li> <li>Automated identification of dynamically allocated FTP and Exchange traffic</li> </ul>	<ul style="list-style-type: none"> <li>Increases visibility into the WAN and applications</li> <li>Eases configuration for both monitoring of and QoS support for key business applications</li> </ul>
<b>AAA/RADIUS</b>	<ul style="list-style-type: none"> <li>Unified framework for authentication services on Peribit devices</li> <li>Per-user authentication and authorization, with different levels of access</li> <li>Support for external user directories (Active Directory, NT Domain)</li> </ul>	<ul style="list-style-type: none"> <li>Allows centralized authentication and authorization of device administrators</li> <li>Provides flexibility with many supported backend databases</li> </ul>
<b>IPSec Encryption</b>	<ul style="list-style-type: none"> <li>Standards-based IPSec encryption between Peribit devices</li> <li>AES and 3DES for encryption</li> <li>HMAC-SHA-1 and HMAC-MD5 for authentication</li> <li>Dynamic key exchange via IKE</li> </ul>	<ul style="list-style-type: none"> <li>Provides remote-to-hub security without need for separate encryption device</li> <li>Enables secure use of Internet or satellite links</li> </ul>

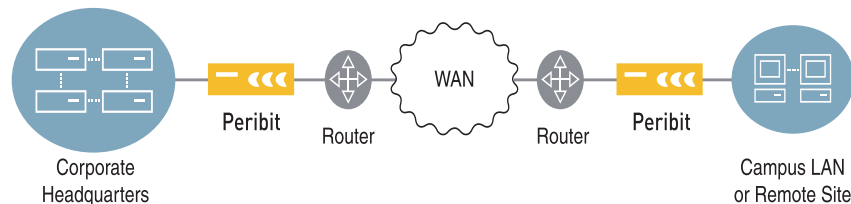
## Sample Topologies

The following topics provide sample deployment topologies for Peribit devices:

- [“Typical Inline Deployment” in the next section](#)
- [“Off-Path Deployment” on page 19](#)
- [“Point-to-Multipoint Topology” on page 19](#)
- [“Virtual Private Network \(VPN\) Topology” on page 20](#)
- [“Multi-Node Configuration” on page 20](#)

### Typical Inline Deployment

Peribit devices must be installed on both sides of the WAN. They are typically deployed in the data path between the LAN and the edge routers (Figure 1-1).



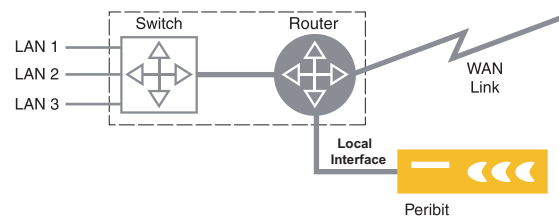
**Figure 1-1 Typical Inline Deployment**

When two or more devices are installed in the same Peribit community, a reduction tunnel is formed between them.

## Off-Path Deployment

Peribit devices are usually deployed in the physical data path between a LAN switch and a WAN edge router, with no changes to layer 3 routing. When interrupting the data path is not practical, such as in collapsed backbone environments where the switch and the router are the same physical device, you can deploy the Peribit device “off path” (Figure 1-2).

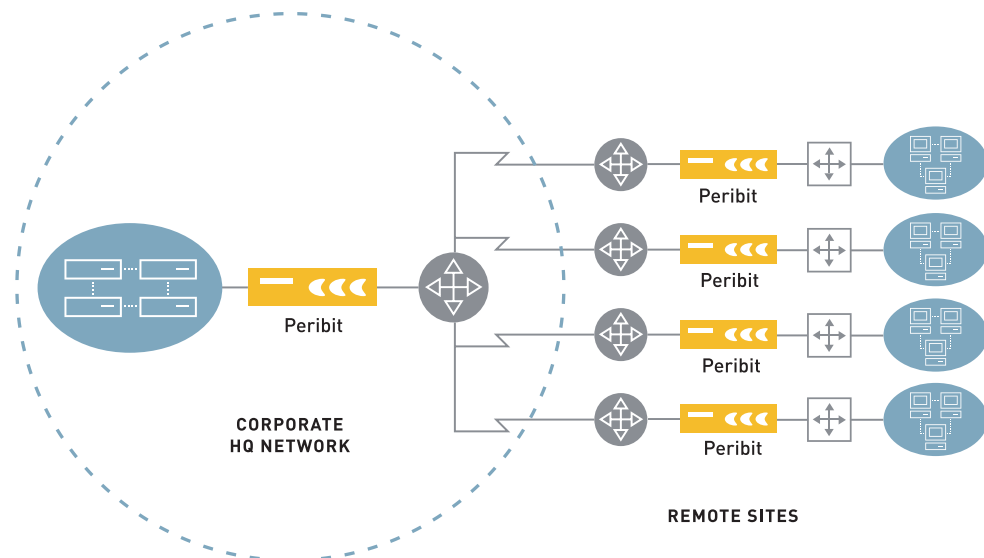
In an off-path deployment, the device’s Local interface is connected to the switch or the router, and the Remote interface is not used (connecting the Local interface directly to the router is recommended).



**Figure 1-2 Off-Path Deployment**

## Point-to-Multipoint Topology

Peribit devices support multi-point configurations of both “hub and spoke” and “mesh” configurations between multiple enterprise sites (Figure 1-3).



**Figure 1-3 Deploying Peribit Devices in a Point-to-Multipoint Configuration**

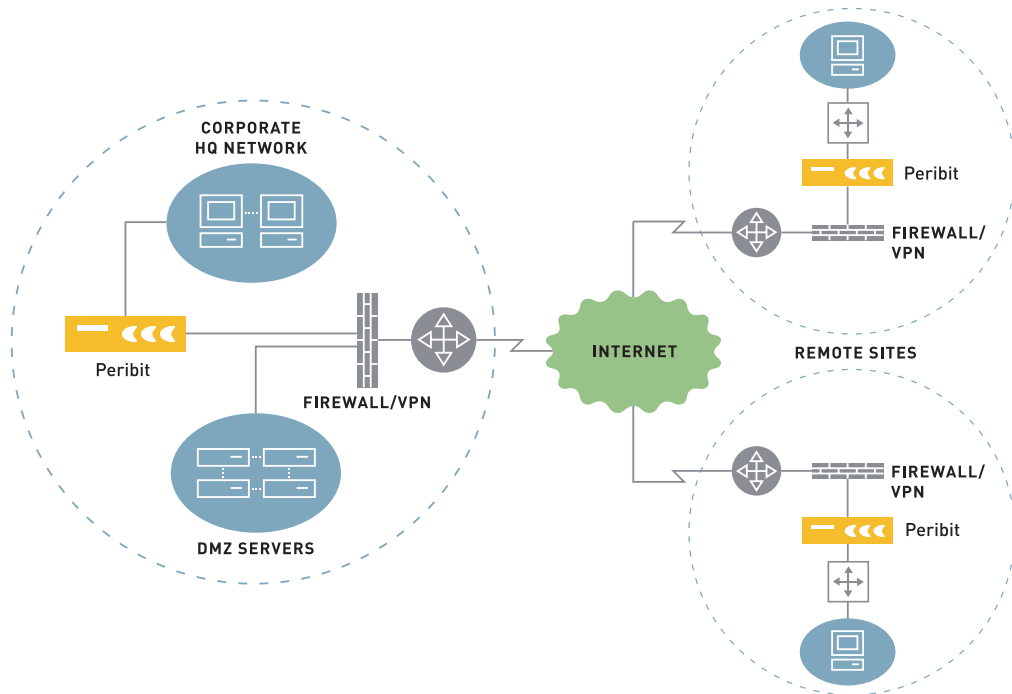
In this example, a hub (located at headquarters) is accessed by workgroups in remote sites. Data reduction tunnels, that are automatically established and managed by the Peribit devices at the various corporate sites, continuously process and reduce the data traveling through these tunnels thereby reducing traffic on the WAN circuits and creating more bandwidth.

Note that it is not necessary to deploy a Peribit device for every remote site that links into the corporate headquarters network. In such instances, data from the hub is passed through without reduction.

In addition, Figure 1-3 shows four remote sites with dedicated connections to the Corporate HQ network. Since the Peribit device is protocol and interface neutral, any of the four links could be any type of public or private packet-based service interface, such as Frame Relay or ATM.

## Virtual Private Network (VPN) Topology

Peribit devices operate transparently relative to existing network equipment, including firewalls and Virtual Private Network (VPN) devices (Figure 1-4).



**Figure 1-4 Deploying Peribit devices in a VPN Configuration**

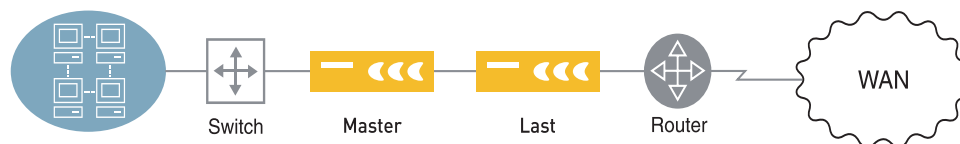
By reducing data before it enters the VPN tunnel, the Peribit device reduces the workload for the VPN devices. The same bandwidth multiplication effect is achieved for VPN encapsulated traffic as for unencapsulated traffic.

## Multi-Node Configuration

Two Peribit devices can work together in a multi-node configuration to provide greater reduction of data on higher-speed or heavily congested networks. In multi-node configurations, one device is designated as the Master, and the other device is designated as the Last.

The Master connects its Local interface to the switch (or other aggregating device) and its Remote interface to the Local interface of the other Last device. The Last device connects its Remote interface to the edge router.

For more information on multi-node configuration, refer to [“Multi-Node Configurations” on page 315](#). Multi-node is not supported on the SR-100.



**Figure 1-5 Installing Two Peribit devices in Multi-Node Configuration**

## Basic Concepts

The following topics provide an overview of key terms and concepts:

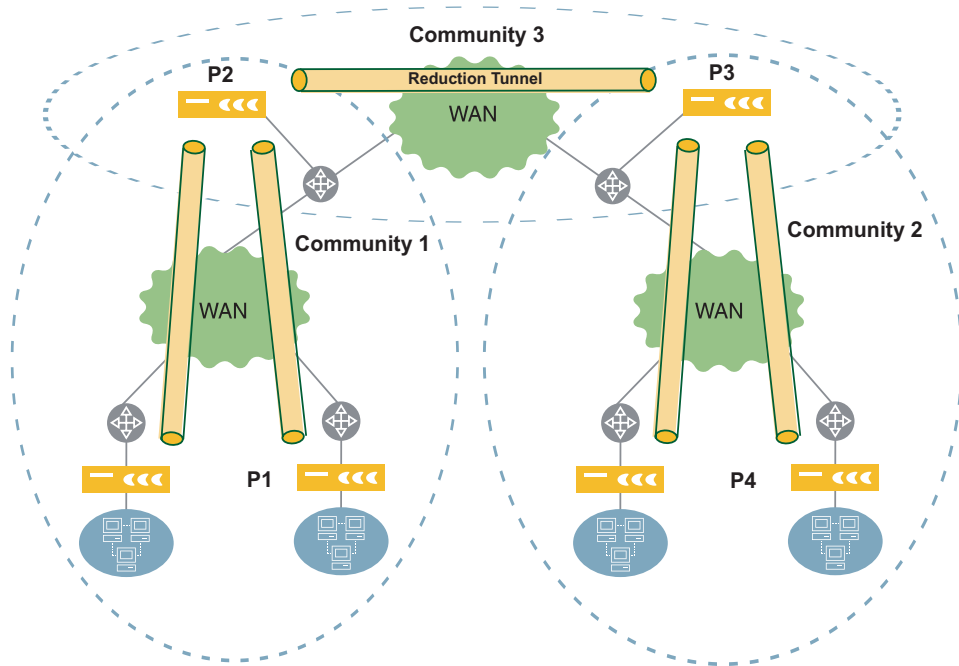
- [“Peribit Communities and Registration Servers” in the next section](#)
- [“Reduction Tunnels” on page 22](#)
- [“Local Routes and Reduction Subnets” on page 23](#)
- [“Remote Routes” on page 23](#)
- [“Community Topologies” on page 24](#)
- [“High Availability Support” on page 24](#)

### Peribit Communities and Registration Servers

At least two Peribit devices are required to perform data reduction (one on each side of the WAN). Two or more Peribit devices that can reduce and assemble data for each other are said to be in the same Peribit community. You can selectively enable or disable data reduction between any two devices in the same community.

When you install a Peribit device, you must specify the IP address of a registration server. The registration server is a Peribit device that stores the network information for all the other Peribit devices that report to it. Each device periodically contacts the registration server to identify the other devices in the same Peribit community. Initially, all devices reporting to the same registration server are in the Default community.

Since data reduction occurs only between Peribit devices in the same community, you can optimize performance in large deployments by limiting the number of devices in each community. To send reduced traffic between communities, you can create a hierarchical structure where selected devices reside in multiple communities (Figure 1-6).



**Figure 1-6 Example of Hierarchical Communities**

In most cases, one registration server can manage all devices and communities in the network. A secondary registration server can be specified to act as a backup if the primary server is unavailable.

## Reduction Tunnels

When you install a new Peribit device and specify a registration server, the device attempts to form a reduction tunnel with each registered device, or “endpoint,” in the same Peribit community. The existing devices also attempt to form tunnels with the new device, so that each device can have two types of tunnels—OUT tunnels that convey reduced data to remote devices, and IN tunnels that convey reduced data to be assembled.

At any time, you can disable data reduction from all other devices and/or reduce data only for specific Peribit devices in the community.

## Local Routes and Reduction Subnets

Local routes are the routes defined in the Peribit device's routing table. When you first install a Peribit device, the routing table contains the local subnet where the device is installed, a route to the default gateway (the default route), and the loopback address. To identify more routes, you can:

- Add static routes manually
- Add dynamic routes using one of the following methods:
  - Enable the Open Shortest Path First (OSPF) and/or the Routing Information Protocol (RIPv1 or RIPv2)
  - Periodically poll the routing table of a Cisco router
  - Import a file of routes from an FTP server

Reduction subnets are the LAN subnets for which the local device can assemble the data reduced by other Peribit devices. Static routes and routes discovered dynamically on the Local interface are added to the list of reduction subnets, which can then be advertised to the other devices in the Peribit community. By default, only the subnets you select are advertised.

In some cases, such as in VLAN environments, some routes on the Local interface may be discovered only on the Remote interface. To advertise these subnets, you must enable the WAN reduction subnet option through the CLI so that routes discovered on the Remote interface are included on the list of reduction subnets.

---

**NOTE:** For off-path devices, where only the Local interface is connected to the network, all routes are listed as reduction subnets because the device cannot distinguish between local and remote routes. In this case, you must be careful to advertise only the routes on the LAN side of the Peribit device.

---

## Remote Routes

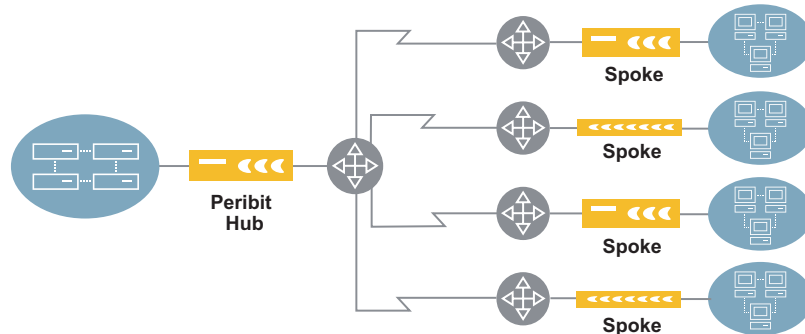
Remote routes are the reduction subnets advertised by the other Peribit devices in the Peribit community. Each device can reduce only the traffic that is destined for a remote route advertised by another Peribit device. You can view the remote routes to determine which routes are advertised by multiple devices. You can also specify how often remote routes are fetched from the other devices, and enable a test to validate each remote route.

Remote routes are advertised each time a device starts, and route changes are advertised as soon as they occur. Fetching routes periodically helps ensure the consistency of routing information across all the Peribit devices in the community.

## Community Topologies

For each device in a Peribit community, you can select a community topology. The community topology setting ensures that each device's resources are allocated efficiently. There are two basic topologies:

- **Mesh.** Multiple devices are interconnected and each one can reduce and assemble data for all the others.
- **Hub and Spoke.** A central device (Hub) can reduce and assemble data for all other devices in the Peribit community (Figure 1-7). By default, the spoke devices reduce data only for the hub. A community can have multiple hubs. Each device attempts to form a reduction tunnel with a hub before creating tunnels to other Peribit devices.



**Figure 1-7 Deploying Peribit devices in a Hub and Spoke Topology**

For Hub and Mesh devices, you can specify the maximum number of devices so that sufficient resources are allocated for the potential number of reduction tunnels.

## High Availability Support

For critical WAN links, you can install backup devices that take over when a primary device is unavailable. Each backup can support one or more primary devices.

In addition, the Peribit devices transparently operate in high-availability (HA) environments. The Local and Remote interfaces can be configured so that when a failure occurs on one interface, the other interface is disabled. This allows the switch or router to detect the failure, and ensures that the routing mechanisms work as expected. After 15 seconds, the disabled interface is reactivated.

For SR-80 and SR-100 devices installed in HA environments, you can disable the hardware passthrough so that a power failure on either device will block all traffic, thus allowing the failure to be detected and traffic routed to the other device.



## Peribit Profile Mode

Peribit Profile Mode (PPM) lets you see how a Peribit device performs in your network without affecting network traffic. In Profile Mode, the device passively calculates potential data reduction statistics for all traffic and for individual applications.

In addition, you can view the performance for specific remote subnets by defining “virtual” Peribit devices and associating one or more subnets with each virtual device. If you also specify a circuit speed, average acceleration gains are estimated for your TCP applications. On the reduction reports, you can then select a virtual device from the Destination menu to view the performance for the associated remote subnets (refer to [“Viewing Results” on page 201](#)).

To use Profile Mode, the Local interface must be connected to a mirrored port on the LAN switch, and the Remote interface must be disconnected. For more information about setting up and using a Peribit device in Profile Mode, refer to [“Peribit Profile Mode” on page 359](#).

## PeriScope Central Management System (CMS)

The PeriScope Central Management System (CMS) is a Web-based tool that lets you centrally manage the configuration and software upgrades for geographically dispersed Peribit devices. From the secure PeriScope CMS Web console you can view the performance of all devices, and apply configuration changes and software upgrades to selected devices. You can also schedule such tasks as upgrades and reboots to occur during off-peak hours.

## Where to Go Next

Refer to [Chapter 2, “Installation”](#) for complete installation instructions, or [Chapter 3, “Configuring Basic Setup Policies”](#) for information on setting up the Peribit device through the Web console.



## Chapter 2 Installation

---

This chapter describes how to install Peribit Sequence Reducers and Sequence Mirrors and perform the initial configuration. It covers the following topics:

- [“Before You Begin” in the next section](#)
- [“Manual and Automatic Installations” on page 28](#)
- [“Inline and Off-path Installations” on page 28](#)
- [“Running Quick Setup through the Web Console” on page 48](#)
- [“Post-Installation Tasks” on page 56](#)

### Before You Begin

Before you install a Peribit device, complete the following pre-installation tasks.

- Ensure that sufficient power is available. Supply circuits should be protected by a maximum 20A circuit breaker.
- Ensure there is ample space and lighting. You need enough space to connect one or two CAT-5 UTP Ethernet data cables and a power cord (two for the SR-80 and SR-100) to the back of the chassis, and the proper lighting to see link status and speed LEDs on the Ethernet data ports.
- Provide a minimum of six inches clearance in the front and back of the chassis. For an SR-15, provide three inches of clearance on both sides of the chassis to allow cooling air to be drawn through the side panels. All other Peribit devices draw cooling air through the front panel. Do not install one device directly behind another where warm or hot air may be recirculated. There are no ventilation requirements above or below the device.
- Do not stack paper materials or heavy equipment on top of a Peribit device.
- For rack-mount installations, reserve space for a 1U form factor device (SR-15, SR-20, and SM-250) or a 2U form factor device (SR-50, SR-55, SR-80, SR-100, and SM-500).
- Identify a 10/100 Ethernet LAN port (for an SR-15, SR-20, SR-50, or SM-250) or a 10/100/1000 LAN port (for an SR-55, SR-80, SR-100, or SM-500) where you can connect the Peribit device. This port is typically on an aggregation switch or other LAN device connected directly to the WAN router. The SR-80 and SR-100 are also available with two 1000 Base-SX fiber-optic Ethernet interfaces.
- For an SR-20, SR-50 or SM-250, identify the TX/RX polarity (MDI/MDI-X) of the Ethernet interfaces. This is useful to determine the type of cable needed (straight-through or crossover).
- Log in to the router that will be on the WAN side of the Sequence Reducer and make a note of the interface speed and duplex mode.
- Verify that ports 3577 and 3578 are open for TCP and UDP data transmission.
- Reserve an IP address and identify the default gateway for the Peribit device. The default gateway is the next hop on the WAN side of the device. Not necessary if automatic installation is available (refer to the next section).

## Battery Warning



**CAUTION:** A Peribit device has no user serviceable parts. Opening the device voids the warranty. As a safety caution, note that opening the chassis exposes a lithium battery. If you attempt to remove or replace the lithium cell, do not use a conductive instrument, as a short-circuit may cause the cell to explode. A replacement cell must be of the same type (CR2032). Dispose of a spent cell promptly—do not recharge, disassemble, or incinerate. Keep cells away from children.

## Manual and Automatic Installations

A manual installation consists of the following steps for each type of Peribit device:

1. Install the hardware and apply power
2. Configure network settings (such as IP address)
3. Run Quick Setup to define required configuration settings
4. Perform post-installation tasks for optional configuration settings

Step 2 through 4 can be performed automatically if you have the PeriScope Central Management System (CMS) and a DHCP server. Entire configurations, including network settings, can be predefined in CMS, and then downloaded automatically when power is first applied to the device. For more information, refer to the *PeriScope CMS 5.0 Administrator's Guide*.

---

**NOTE:** Automatic installation cannot be used for multi-node configurations (refer to “Multi-Node Configurations” on page 315).

---

## Inline and Off-path Installations

Peribit devices are usually installed in the data path (inline) between a LAN switch (or other aggregation device) and the WAN edge router. If interrupting the data path is not practical, such as in collapsed backbone environments, you can deploy the device “off path.” Installing a Peribit device off path is similar to an inline installation, except for the following:

- Do not disconnect any cables —simply connect the device’s Local interface to the switch or the router. Connecting directly to the router is recommended. The interface should be full-duplex (half-duplex may cause excessive collisions).
- Do not connect the Remote interface to the router. The Remote interface is not used, so you can apply power to the Peribit device without first verifying connectivity between the LAN and the router.
- After you run Quick Setup, use RIP, WCCP, or policy-based routing to route traffic to the off-path device, as described in [“Configuring Packet Interception” on page 104](#).

The following sections describe how to install each type of Peribit device in the data path.

- [“Interface Speeds and Modes” on page 29](#)
- [“Installing the SR-15, SR-20, and SM-250” on page 29](#)
- [“Installing the SR-50 and SR-55 Sequence Reducer” on page 34](#)

- [“Installing the SR-80 and SR-100 Sequence Reducer” on page 38](#)
- [“Installing the SM-500 Sequence Mirror” on page 45](#)

## Interface Speeds and Modes

Interface speed and duplex settings should be the same across all devices: the switch, the Peribit Local and Remote interfaces, and the router. This ensures connectivity through the Peribit device in the event of a power loss or a condition that causes a hardware bypass. Note that this is not an issue for fiber-optic versions of the SR-80 or SR-100 because fiber does not support hardware bypass.

## Installing the SR-15, SR-20, and SM-250

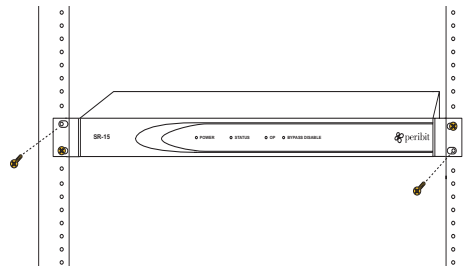
This section describes the installation process for the SR-15, SR-20, and SM-250.

- [“SR-15, SR-20, and SM-250 Hardware Installation” in the next section](#)
- [“Configuring Network Settings for the SR-15, SR-20, and SM-250” on page 31.](#)

### SR-15, SR-20, and SM-250 Hardware Installation

To install the SR-15, SR-20, or SM-250 in your network:

1. Set up the chassis.
  - To install the Peribit device in a 19-inch device rack, install the supplied brackets (front panel forward) to the sides of the device with the countersunk screws provided. Next, install the chassis in your network device rack (Figure 2-1).



**Figure 2-1** Installing the SR-15 in a 19-inch Device Rack

- To install the SR-15 on a desktop, place the chassis on a desktop or on top of another device so that all four rubber feet are securely mounted to the flat surface. For an SR-20 or SM-250, you must first install the supplied rubber feet in the marked areas on the bottom of the chassis.
2. Connect the network cables to the Peribit device.

---

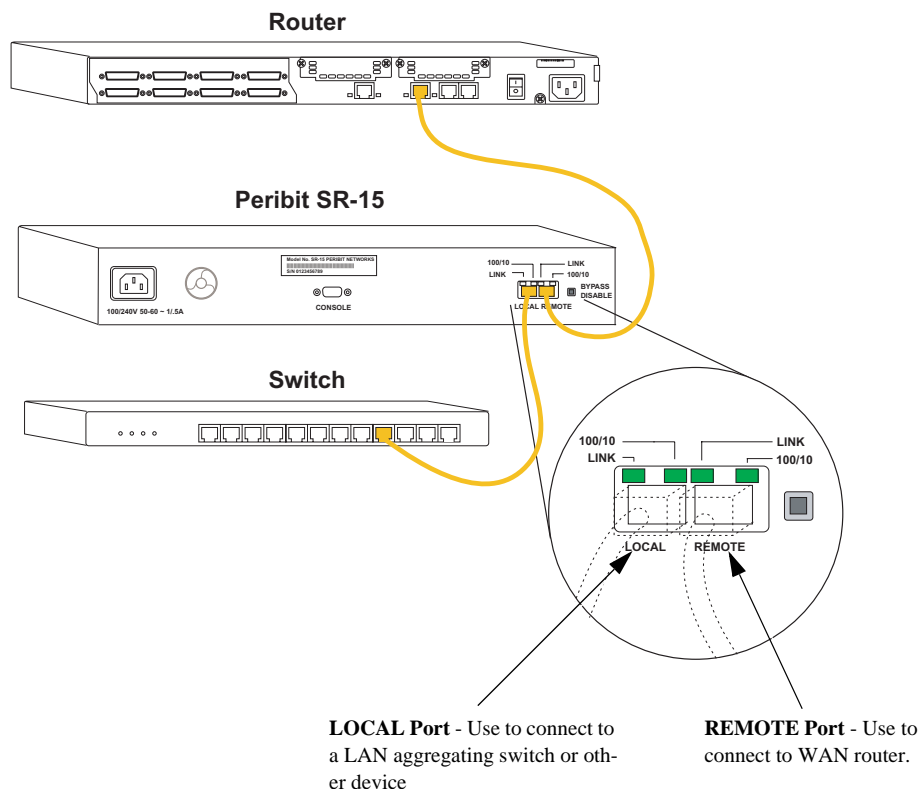
**IMPORTANT:** Do not connect power to the device until Step 4.

---

The SR-15, SR-20, and SM-250 have two 10/100 Ethernet interfaces. These RJ-45 ports are labeled REMOTE and LOCAL on the back of the chassis (Figure 2-2).

To connect the network cables:

- a. Locate the cable that connects the switch (or other aggregating device) to the router.
- b. Disconnect this cable from the router and connect it to the LOCAL port on the Peribit device.
- c. Connect a straight-through cable (not provided) from the router port to the REMOTE port on the Peribit device.



**Figure 2-2 SR-15 Ethernet Ports**

3. Use one of the following methods to verify connectivity across the Peribit device when the power is off. This step ensures that the correct cables are used and that traffic will pass through the device in the event of a power loss.
  - Ping a host on the remote side of the Peribit device from a host on the local side of the device.
  - Observe the link status LEDs (if available) on the interfaces of the adjacent network devices (switch and router).
4. After you verify network connectivity across the Peribit device, plug in the supplied power cord to the back of the chassis, and then connect the power cord to the local power source.

---

**NOTE:** The maximum power usage is 50 Watts Max or 170 BTU/hour for the SR-15, and 150 Watts Max or 510 BTU/hour for the SR-20 and SM-250.

---

Now that the Peribit device is installed and powered on, continue to the next section to configure network settings for the device.

## Configuring Network Settings for the SR-15, SR-20, and SM-250

If you have the PeriScope CMS management system, a full device configuration can be downloaded automatically when you first apply power to the device (refer to [“Manual and Automatic Installations”](#) on page 28). To manually configure the network settings for the SR-15, SR-20, or SM-250, connect an ANSI compatible terminal to the serial console port and use a terminal emulation program (such as HyperTerminal) to enter the CLI commands described here.

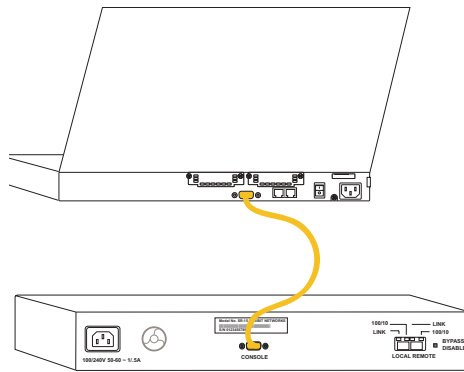
---

**NOTE:** The serial console port is of type RS-232 (AT-compatible) with a male, DB-9 connector. You should use a female/female DB-9 crossover cable (such as a null-modem cable) when connecting directly to a PC serial port. The pin-outs for the console port are shown in [“DB9 Console Port Pin-Outs”](#) on page 337.

---

To set IP parameters for the device using a terminal emulation program:

1. Connect an ANSI compatible terminal to the serial port on the back of the Peribit device (Figure 2-3).



**Figure 2-3 Connecting the SR-15 to an ANSI Compatible Terminal**

2. Verify the serial port settings are as follows:
  - Baud rate: 9600 bps
  - Data bits: 8
  - Parity: none
  - Stop bits: 1
  - Flow control: none
3. Start the terminal emulation program (such as HyperTerminal), and choose to connect via the serial port.
4. At the User name and Password prompts, type **admin** for the user name and **peribit** for the password.

---

**NOTE:** This is a factory-configured password for the device. You will be asked to change the default password during the Quick Setup.

---

5. Press **Enter** and enter the following network information at the prompts:

- a. Type an IP address for the Peribit device, and then press **Enter**.
- b. Type the subnet mask for the network, and then press **Enter**.
- c. Type the default gateway address for the device, and then press **Enter**.

Press **Enter** to confirm the network settings.

6. By default, the Local and Remote interfaces are set to auto-negotiate the speed and duplex mode. However, to avoid problems when the switch or router speed and duplex mode are set manually, it is **strongly recommended** that you manually configure the Local and Remote interface settings.

To manually configure the interface settings:

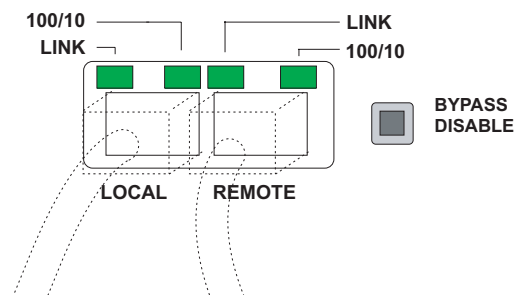
- a. At the prompt to configure the interface settings, type “y” and press **Enter**.
- b. Enter a number (0 to 4) for the speed and mode of the Local interface.

- 0 - 10-full
- 1 - 10-half
- 2 - 100-full
- 3 - 100-half
- 4 - auto

Press **Enter** to confirm the setting, and then repeat for the Remote interface.

7. You can continue the Quick Setup or just press **Enter** at each prompt, and later run Quick Setup from the Web console. Note that the last prompt is to save the configuration as *startup.cfg*, which is used when you reboot the device.

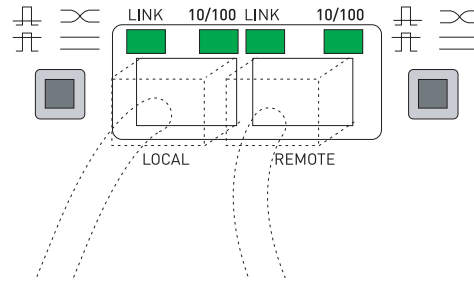
8. Check the LEDs above the Ethernet ports. Figure 2-4 shows the LEDs for the SR-15. Figure 2-5 shows the LEDs for the SR-20 and SM-250.



**Figure 2-4** Checking the SR-15 Link LEDs

- The LINK LEDs indicate the device is properly connected. If the LINK LEDs do not light, toggle the MDI/MDI-X buttons (SR-20 and SM-250 only).
- The 100/10 LEDs for the REMOTE and LOCAL ports indicate 100 Mbps connectivity when the light is on.





**Figure 2-5** Checking the SR-20 and SM-250 Link LEDs

- If you install the SR-15 in a high-availability environment, you can press the **Bypass Disable** button to block all traffic through the device during a power failure. This allows power failures to be detected and the traffic routed to an alternate device. By default, all traffic passes through the device during a power failure.

9. Check the LEDs on the front panel:

**Table 2-1** SR-15, SR-20, and SM-250 Front Panel LEDs

Front Panel LED	Model	Description
POWER	All	Indicates that power is on.
BYPASS	SR-20, SM-250	Indicates traffic is passing through without any processing (hardware passthrough). Occurs during a reboot, system failure, or power failure.
STATUS	SR-15	Indicates the device has contacted the registration server in the last 24 hours. After 24 hours of no contact with the registration server, the light is turned off, and traffic is passed through without any processing (software passthrough).
OPERATIONAL	SR-15	Indicates normal operation. During a reboot, a system failure, or a power failure, the light is turned off, and traffic is passed through without any processing (hardware passthrough).
BYPASS DISABLE	SR-15	Indicates that a power failure will block all traffic through the device (hardware passthrough disabled). To enable or disable hardware passthrough, press the <b>Bypass Disable</b> button on the back panel.

The installation is complete. You can now run Quick Setup, as described in [“Running Quick Setup through the Web Console” on page 48](#).

## Installing the SR-50 and SR-55 Sequence Reducer

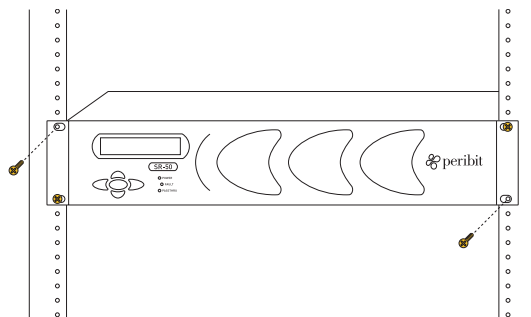
This section describes the installation process for the SR-50 and SR-55 Sequence Reducer.

- “SR-50 and SR-55 Hardware Installation” in the next section
- “Configuring Network Settings for the SR-50 and SR-55” on page 36.

### SR-50 and SR-55 Hardware Installation

To install the Sequence Reducer in your network:

1. Set up the chassis.
  - If you plan to install the Sequence Reducer in a 19-inch device rack, install the supplied brackets (front panel forward) to the sides of the device with the countersunk screws provided in the kit. Next, install the chassis in your network device rack (Figure 2-6).



**Figure 2-6** Setting Up the Sequence Reducer Chassis

- If you plan to install the Sequence Reducer on a desktop, place the chassis upside down on a smooth, flat surface. Next, install the supplied rubber feet in the marked areas on the bottom of the chassis. Finally, place the chassis on a desktop or on top of another device so that all four rubber feet are securely mounted to the flat surface.
2. Connect the network cables.

---

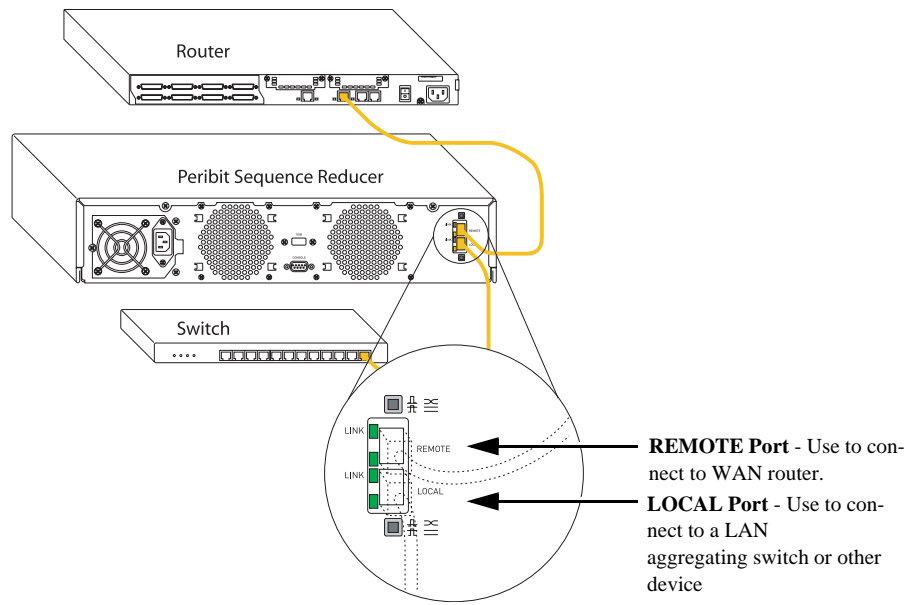
**IMPORTANT:** Do not connect power to the device until Step 4.

---

The SR-50 is configured with two 10/100 auto-sensing, Ethernet interfaces. The SR-55 is configured with two 10/100/1000 auto-sensing, Ethernet interfaces. These RJ-45 ports are labeled REMOTE and LOCAL on the back of the chassis (Figure 2-7 on page 35).

To connect the network cables to the Sequence Reducer:

- a. Locate the cable that connects the switch (or other aggregating device) to the router.
- b. Disconnect this cable from the router port and connect it to the Sequence Reducer's LOCAL port.
- c. Using a straight-through cable (not provided), connect one end to the Sequence Reducer's REMOTE port and the other end to the router port.



**Figure 2-7 Peribit Sequence Reducer Ethernet Ports**

3. Use one of the following methods to verify connectivity across the Sequence Reducer when the power is off. This step ensures that the correct cables are used and that traffic will pass through the Sequence Reducer in the event of a power loss.
  - Ping a host on the remote side of the Sequence Reducer from a host on the local side of the Sequence Reducer.
  - Observe the link status LEDs (if available) on the interfaces of the adjacent network devices (switch and router).
4. After you verify network connectivity across the Sequence Reducer, plug in the supplied power cord to the back of the chassis, and then connect the power cord to the local power source.

---

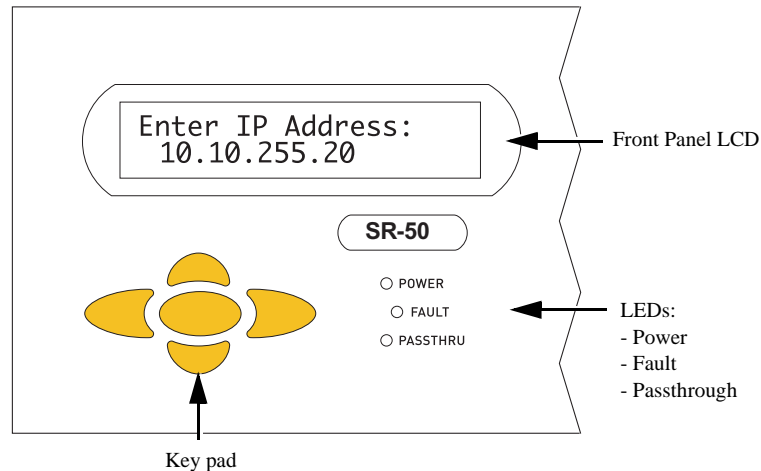
**NOTE:** The SR-50 and SR-55 maximum power usage is 150 Watts Max or 510 BTU/hour.

---

Now that the Sequence Reducer is installed and powered on, continue to the next section to configure network settings.

## Configuring Network Settings for the SR-50 and SR-55

The configuration can be downloaded automatically from PeriScope CMS when you first apply power to the device (refer to [“Manual and Automatic Installations” on page 28](#)). To configure the network settings manually, use the front-panel keypad and LCD as described below. Figure 2-8 shows the front panel keypad and LCD of the SR-50.



**Figure 2-8 SR-50 Front Panel Keypad and LCD**

When you start the Sequence Reducer, the “Peribit Networks” message appears in the front panel LCD.

1. Press the **Enter** button (center button).
2. At the “Select Setup Network\_” prompt in the LCD, press **Enter**.
3. Use the front-panel keypad to assign an IP address, the subnet mask, and the default gateway for the Sequence Reducer as follows:
  - Use the up and down arrow buttons to display a number (between 0-9).
  - Use the left and right arrow buttons to move to the previous or next character.
  - Press **Enter** (the center button) after each setting.
  - After you enter the gateway address, use the left arrow to select “Save & Reboot” and press **Enter**.

---

**NOTE:** The default gateway is typically the next hop on the Remote side of the Sequence Reducer. You can change this later if you designate the Sequence Reducer as a default assembler (refer to [“Defining Default Assemblers” on page 135](#)).

---

4. After the device reboots, specify the speed and mode of each interface. By default, the Local and Remote interfaces are set to auto-negotiate. However, to avoid problems when the switch or router speed and duplex mode are set manually, it is **strongly recommended** that you manually configure the Local and Remote interface settings.

To configure the Sequence Reducer's interfaces from the front panel:

- a. Press **Enter** to display the "Select Setup Network\_" prompt in the LCD.
- b. Use the down arrow to show the "Local If Settings" menu option, and press **Enter**.
- c. Use the left arrow to select "Y", and press **Enter**.
- d. Use the down arrow to show the desired interface setting, and press **Enter**.

SR-50: 10/Half, 10/Full, 100/Half, 100/Full, Auto-Negotiate

SR-55: 10/Half, 10/Full, 100/Half, 100/Full, 1000/Full, Auto-Negotiate

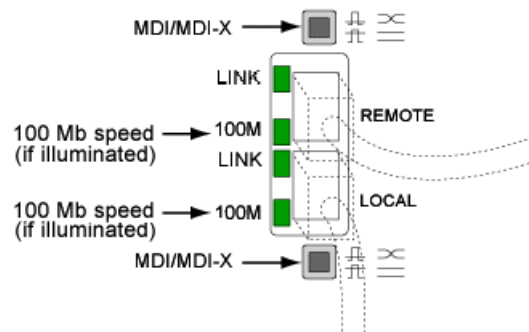
- e. Use the left arrow to select "Commit&Save", and press **Enter**. Repeat this process for the Remote interface.

---

**NOTE:** After installation, you can change the Sequence Reducer's interface settings from the Web console or CLI.

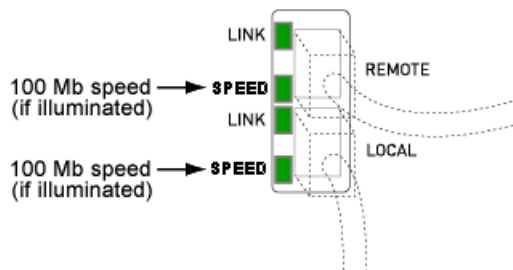
---

5. Check the LEDs next to the Ethernet ports. Figure 2-9 shows the SR-50 LEDs. Figure 2-9 shows the SR-55 LEDs.



**Figure 2-9** Checking the Link LEDs for the SR-50

- If the LINK LEDs light, the device is properly connected.
- If the LINK LEDs do not light, toggle the MDI/MDI-X buttons (SR-50 only).
- On the SR-50, the 100M LEDs for the REMOTE and LOCAL ports indicate 100 Mbps connectivity. On the SR-55, the SPEED LED indicates 100 or 1000 Mbps connectivity. To verify the interface speed for the SR-55, use the front panel or the CLI.



**Figure 2-10** Checking the Link LEDs for the SR-55

The installation is complete. You can now run Quick Setup, as described in [“Running Quick Setup through the Web Console”](#) on page 48.

## Installing the SR-80 and SR-100 Sequence Reducer

The SR-80 and SR-100 are very similar, except that the SR-100 can act as a server to distribute the processing load to up to six client Sequence Reducers. The client Sequence Reducers are connected directly to the SR-100, and can be any mix of SR-50s, SR-55s, and SR-80s.

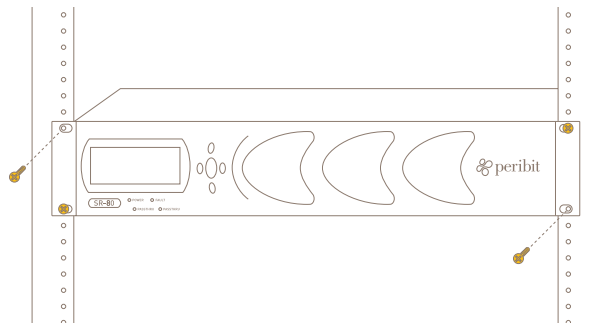
The following sections describe the installation process for the SR-80 and SR-100.

- [“SR-80 and SR-100 Hardware Installation”](#) in the next section
- [“Configuring Network Settings for the SR-80 and SR-100”](#) on page 40
- [“Connecting Client Devices to the SR-100”](#) on page 43
- [“Disconnecting Client Devices from the SR-100”](#) on page 44

### SR-80 and SR-100 Hardware Installation

To install the Sequence Reducer in your network:

1. Set up the chassis.
  - To install the Sequence Reducer in a 19-inch device rack, install the supplied brackets (front panel forward) to the sides of the device with the countersunk screws provided in the kit. Next, install the chassis in your network device rack (Figure 2-11). For an SR-100, leave adequate space to install additional client devices.



**Figure 2-11** Setting Up the Sequence Reducer Chassis

- To install the Sequence Reducer on a desktop, place the chassis upside down on a smooth, flat surface. Next, install the supplied rubber feet in the marked areas on the bottom of the chassis. Finally, place the chassis on a desktop or on top of another device so that all four rubber feet are securely mounted to the flat surface.

The subsequent steps depend on whether the Sequence Reducer has standard copper-wire or fiber-optic interfaces.

## Copper-wire Interfaces

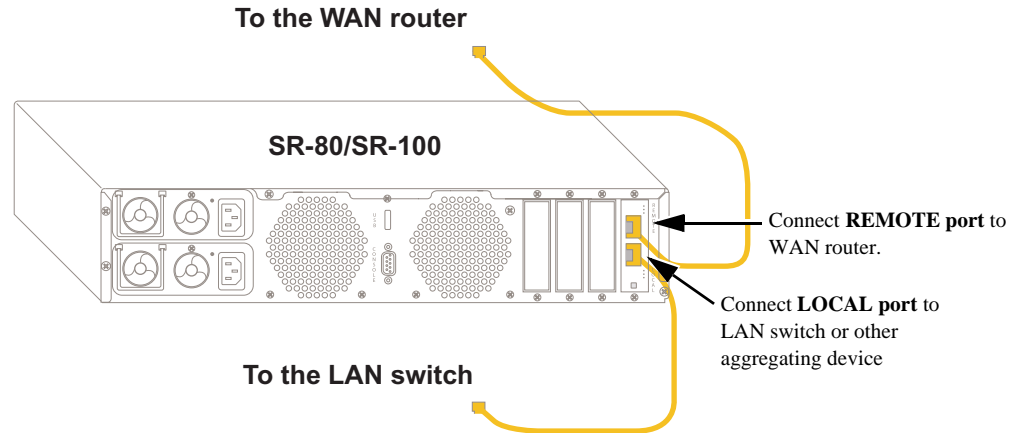
2. Connect the network cables and verify connectivity.

The standard SR-80 and SR-100 have two 10/100/1000 auto-sensing, Ethernet interfaces. These ports are labeled REMOTE and LOCAL on the back of the chassis (Figure 2-12).

---

**IMPORTANT:** Do not connect power to the device until Step 4.

---



**Figure 2-12 Peribit Sequence Reducer Ethernet Ports**

To connect the network cables to the Sequence Reducer:

- a. Locate the cable that connects the switch (or other aggregating device) to the router.
  - b. Disconnect this cable from the router port and connect it to the Sequence Reducer's LOCAL port.
  - c. Using a straight-through cable (not provided), connect one end to the Sequence Reducer's REMOTE port and the other end to the router port.
3. Use one of the following methods to verify connectivity across the Sequence Reducer when the power is off. This step ensures that the correct cables are used and that traffic will bypass (pass through) the Sequence Reducer in the event of a power loss.
    - Ping a host on the remote side of the Sequence Reducer from a host on the local side of the Sequence Reducer.
    - Observe the link status LEDs (if available) on the interfaces of the adjacent network devices (switch and router).
  4. After you verify network connectivity across the Sequence Reducer, connect the supplied power cords to the dual power supplies on the back of the chassis, and then connect the power cords to the local power source.

---

**NOTE:** The SR-80 and SR-100 maximum power usage is 250 Watts or 850 BTU/hour.

---

Now that the Sequence Reducer is installed and powered on, configure network settings, as described in [“Configuring Network Settings for the SR-80 and SR-100” on this page](#).

### Fiber-optic Interfaces

The fiber-optic SR-80 and SR-100 are installed in the same way as the copper-wire version, except that you can apply the power before you connect the cables. Fiber-optic technology does not support a hard-wire passthrough connectivity in the event of a power loss.

---

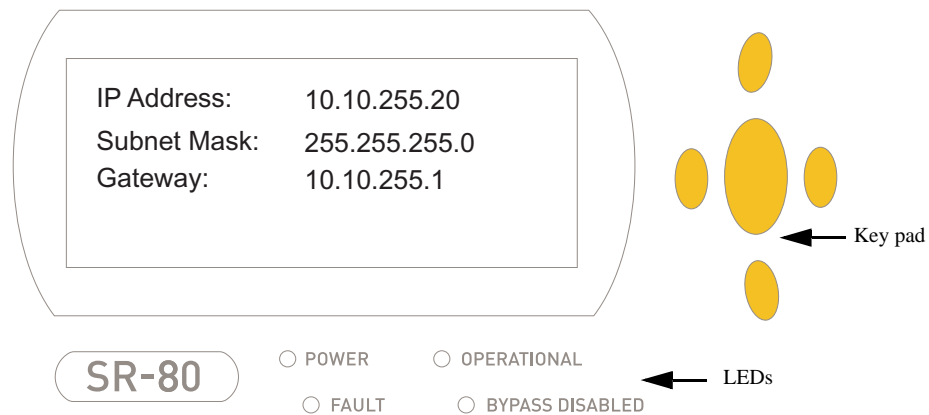
**IMPORTANT:** The fiber-optic SR-80 and SR-100 should be installed in a high-availability environment. Data transmission stops during a reboot or a power failure.

---

Continue to the next section to configure the SR-80 and SR-100 network settings.

### Configuring Network Settings for the SR-80 and SR-100

The configuration can be downloaded automatically from PeriScope CMS when you first apply power to the device (refer to [“Manual and Automatic Installations”](#) on page 28). To configure the network settings manually, use the front-panel keypad and LCD as described below. Figure 2-13 shows the front panel keypad and LCD of the SR-80.



**Figure 2-13 SR-80 Front Panel Keypad and LCD**

When you start the Sequence Reducer, the “Peribit Networks” message appears in the front panel LCD.

1. Press the **Enter** button (center button) to display the menu in the LCD.
2. Press **Enter** to select Setup.
3. Use the front-panel keypad to assign an IP address, subnet mask, and default gateway for the Sequence Reducer, as follows:
  - Use the up or down arrow to select “IP Address” and press **Enter**.
  - Use the up and down arrow buttons to display a number (between 0-9).
  - Use the left and right arrow buttons to move to the previous or next character.
  - When the IP address is correct, press **Enter**.



- Repeat this procedure for the subnet mask and default gateway.
- After you enter the gateway address, use the left arrow to select “Save and Reboot” and press **Enter**.

---

**NOTE:** The default gateway is typically the next hop on the Remote side of the Sequence Reducer. You may want to change the default gateway if you designate a Sequence Reducer as a Default Assembler. After installing the Sequence Reducer, refer to [“Defining Default Assemblers” on page 135](#) for more information.

---

4. After the device reboots, specify the speed and mode of each interface. By default, the Local and Remote interfaces are set to auto-negotiate. However, to avoid problems when the switch or router speed and duplex mode are set manually, it is **strongly recommended** that you manually configure the Local and Remote interface settings.

To manually configure the interfaces from the front panel:

- a. Press **Enter** to display the menu in the LCD.
- b. Use the down arrow to select the “Interfaces” menu option, and press **Enter**.
- c. Use the up arrow to select “Remote” and press **Enter**.
- d. Use the up arrow to select “Manual”.
- e. Use the right arrow to move to the speed setting.
- f. Use the up arrow to select one of the following settings to match the speed and mode of the router, and press **Enter**:
 

**Copper-wire options:** 10 half, 10 full, 100 half, 100 full, 1000 full

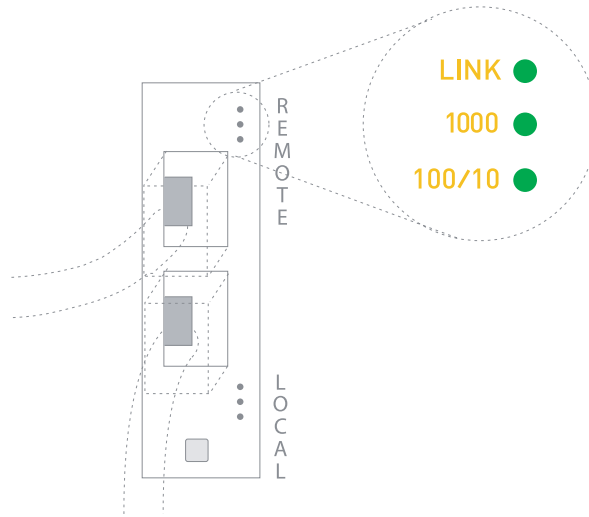
**Fiber-optic options:** 1000 full
- g. Use the up arrow to select “Local”, press **Enter**, and repeat Steps **d** to **f**. Select a setting to match the speed and mode of the switch.
- h. Select **Commit and Save** and press **Enter**.

---

**NOTE:** After installation, you can change the Sequence Reducer’s interface settings from the Web console or CLI.

---

5. Check the LEDs next to the Ethernet ports (Figure 2-14). Note that the fiber-optic version has only the top two LEDs (the fiber-optic interfaces always run at 1 Gbps).



**Figure 2-14** Checking the Link LEDs for the SR-80 and SR-100

- The LINK LEDs indicate the port is connected properly.
  - The 1000 LEDs indicate the port is running at 1000 Mbps.
  - The 100/10 LEDs indicate the port is running at 100 Mbps (not shown for fiber-optic interfaces). If the 1000M and 100/10 LEDs are off, the port is running at 10 Mbps.
6. If you install the copper-wire SR-80 or SR-100 in a high-availability environment, you can press the Bypass Disable button to disable the hardware passthrough feature, which will block all traffic through the device during a power failure. This allows power failures to be detected and the traffic routed to an alternate device. When passthrough is disabled, the BYPASS DISABLED LED on the front panel is illuminated.

---

**NOTE:** The BYPASS LED on the SR-20, like the PASSTHRU LED on the SR-50 and SR-55, indicates when data is passing through the device without compression (software passthrough). Hardware passthrough can be disabled only on the SR-15 and on the copper-wire SR-80 and SR-100 (the fiber-optic versions always block traffic during a failure).

---

The installation is complete. You can now run Quick Setup, as described in [“Running Quick Setup through the Web Console” on page 48](#).

## Connecting Client Devices to the SR-100

After you install the SR-100 and run Quick Setup, you can add more processing capacity at any time by connecting up to six SR-50s, SR-55s, and/or SR-80s to the SR-100 (in any combination). The connected devices are considered clients of the SR-100 server.

To connect one or more client Sequence Reducers to the SR-100:

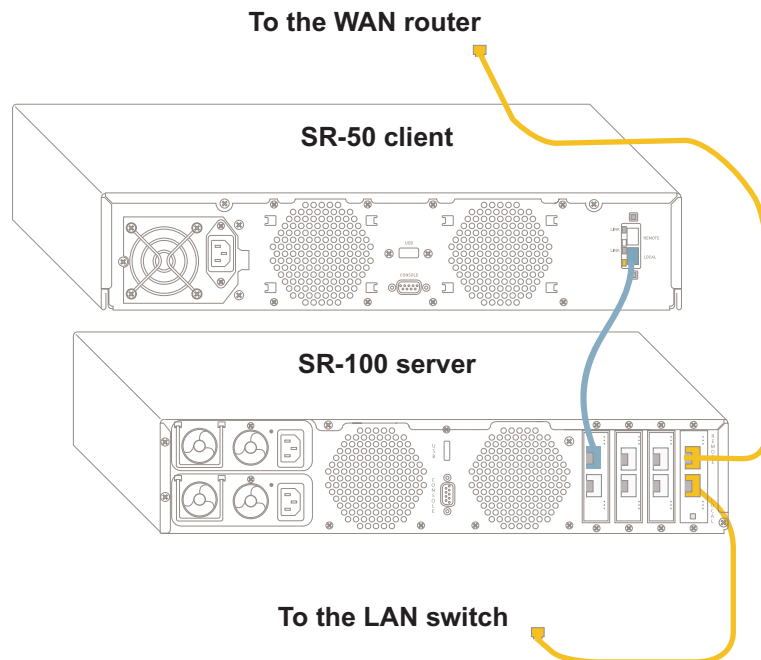
1. If necessary, upgrade the client devices to SRS 5.0 or later, specify the IP information, and run Quick Setup. Note that if you use a console connected to the device, you can enter any IP address and gateway (the SR-100 will change them to internal addresses).

2. Log in to each client Sequence Reducer and enter the following commands:

```
config stack-group set client-mode on
commit
save-config
reboot
```

Type “y” to confirm the save and the reboot.

3. Mount the client devices (SR-50s, SR-55s, and/or SR-80s) near the SR-100.
4. On each client device, connect a straight-through cable from the LOCAL port on the client to one of the ports numbered 1 to 6 on the SR-100. The port number becomes the client ID, and is shown on the client’s front panel.



**Figure B-15** Connecting Client Devices to the SR-100

5. Plug in the supplied power cord to the back of each client, and then connect the power cord to the local power source.

The SR-100 assigns an IP address to each client. The client addresses are internal to the SR-100, so the clients cannot be accessed by other devices. If the SRS version on the client and server are not the same, the client downloads the SRS image from the SR-100.

The client configuration is complete. A client device can be accessed only through the command console (no Web or SSH interface). Note that on the SR-100, the number of client devices is shown in the banner of the Web console. The Endpoints page on the SR-100 indicates which tunnels are handled by each client (refer to [“Configuring Endpoints for Reduction Tunnels” on page 123](#)).

## Disconnecting Client Devices from the SR-100

To return a client device to stand-alone operation, you must reload the factory default settings:

1. Disconnect the cable from the client device to the SR-100.
2. For an SR-55 or SR-80 client, you can reload the factory default settings from the front panel. For an SR-50 client, connect a terminal to the console port, log in, and enter the following command:

```
load-config factory-default
```

When the factory defaults are reloaded, unplug the power cable from the back of the client, plug the cable back in, and then specify the IP address, subnet mask, and default gateway for the device.

## Installing the SM-500 Sequence Mirror

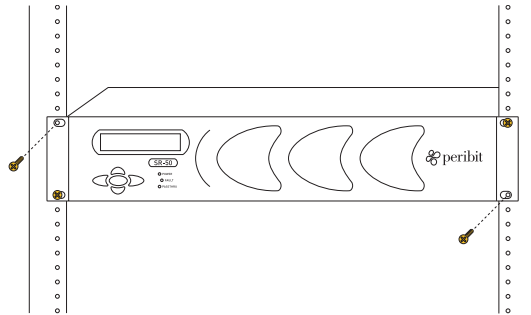
This section describes the installation process for the SM-500 Sequence Mirror.

- “SM--500 Hardware Installation” in the next section
- “Configuring Network Settings for the SM-500” on page 47.

### SM--500 Hardware Installation

To install the SM-500 in your network:

1. Set up the chassis.
  - If you plan to install the SM-500 in a 19-inch device rack, install the supplied brackets (front panel forward) to the sides of the device with the countersunk screws provided in the kit. Next, install the chassis in your network device rack (Figure 2-6).



**Figure 2-16** Setting Up the Sequence Mirror Chassis

- If you plan to install the SM-500 on a desktop, place the chassis upside down on a smooth, flat surface. Next, install the supplied rubber feet in the marked areas on the bottom of the chassis. Finally, place the chassis on a desktop or on top of another device so that all four rubber feet are securely mounted to the flat surface.
2. Connect the network cables.

---

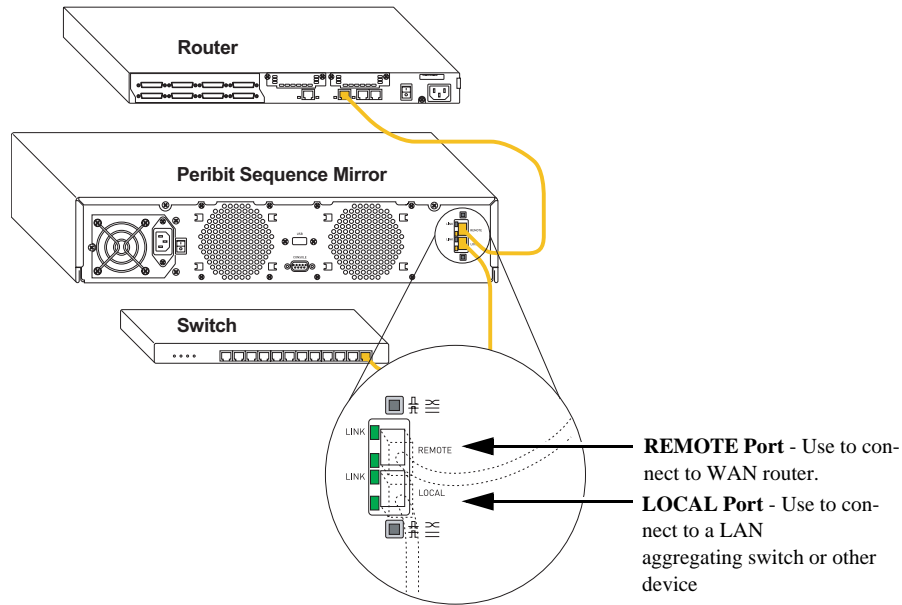
**IMPORTANT:** Do not connect power to the device until Step 4.

---

The SM-500 has two 10/100/1000 auto-sensing, Ethernet interfaces. These RJ-45 ports are labeled REMOTE and LOCAL on the back of the chassis (Figure 2-17 on page 46).

To connect the network cables to the Sequence Mirror:

- a. Locate the cable that connects the switch (or other aggregating device) to the router.
- b. Disconnect this cable from the router port and connect it to the Sequence Mirror’s LOCAL port.
- c. Using a straight-through cable (not provided), connect one end to the Sequence Mirror’s REMOTE port and the other end to the router port.



**Figure 2-17 Peribit Sequence Reducer Ethernet Ports**

3. Use one of the following methods to verify connectivity across the Sequence Mirror when the power is off. This step ensures that the correct cables are used and that traffic will pass through the device in the event of a power loss.
  - Ping a host on the remote side of the Sequence Mirror from a host on the local side of the Sequence Mirror.
  - Observe the link status LEDs (if available) on the interfaces of the adjacent network devices (switch and router).
4. After you verify network connectivity across the Sequence Mirror, plug in the supplied power cord to the back of the chassis, and then connect the power cord to the local power source. Turn on the power switch.

---

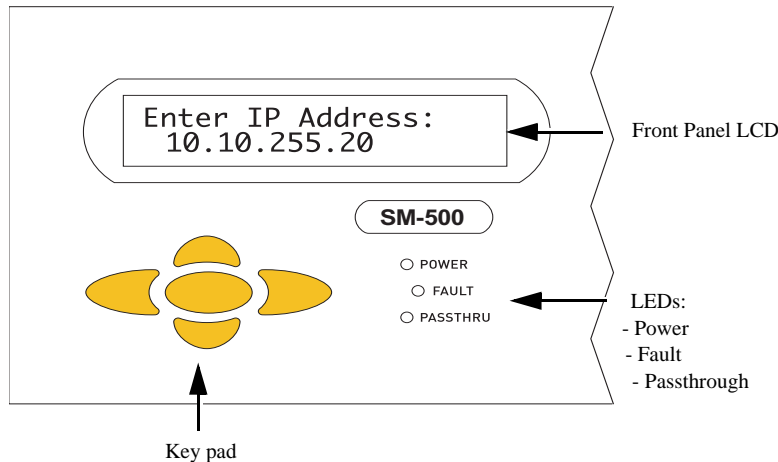
**NOTE:** The SM-500 maximum power usage is 150 Watts Max or 510 BTU/hour.

---

Now that the Sequence Mirror is installed and powered on, continue to the next section to configure network settings.

## Configuring Network Settings for the SM-500

The configuration can be downloaded automatically from PeriScope CMS when you first apply power to the device (refer to [“Manual and Automatic Installations”](#) on page 28). To configure the network settings manually, use the front-panel keypad and LCD as described below. Figure 2-8 shows the front panel keypad and LCD of the SR-50.



**Figure 2-18 SM-500 Front Panel Keypad and LCD**

When you start the Sequence Mirror, the “Peribit Networks” message appears in the front panel LCD.

1. Press the **Enter** button (center button).
2. At the “Select Setup Network\_” prompt in the LCD, press **Enter**.
3. Use the front-panel keypad to assign an IP address, the subnet mask, and the default gateway for the Sequence Mirror as follows:
  - Use the up and down arrow buttons to display a number (between 0-9).
  - Use the left and right arrow buttons to move to the previous or next character.
  - Press **Enter** (the center button) after each setting.
  - After you enter the gateway address, use the left arrow to select “Save & Commit” and press **Enter**.

---

**NOTE:** The default gateway is typically the next hop on the Remote side of the device. You can change this later if you designate the Sequence Mirror as a default assembler (refer to [“Defining Default Assemblers”](#) on page 135).

---

4. After the device reboots, specify the speed and mode of each interface. By default, the Local and Remote interfaces are set to auto-negotiate. However, to avoid problems when the switch or router speed and duplex mode are set manually, it is **strongly recommended** that you manually configure the Local and Remote interface settings.

To configure the interfaces from the front panel:

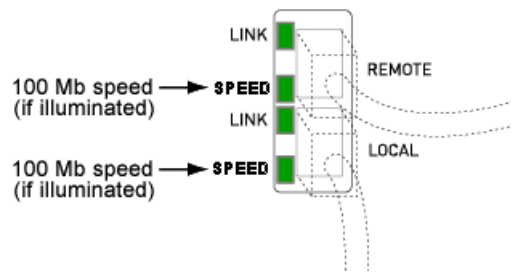
- a. Press **Enter** to display the “Select Setup Network\_” prompt in the LCD.
- b. Use the down arrow to show the “Local If Settings” menu option, and press **Enter**.
- c. Use the left arrow to select “Y”, and press **Enter**.
- d. Use the down arrow to show the desired interface setting, and press **Enter**.  
10/Half, 10/Full, 100/Half, 100/Full, 1000/Full, Auto-Negotiate
- e. Use the left arrow to select “Commit&Save”, and press **Enter**. Repeat this process for the Remote interface.

---

**NOTE:** After installation, you can change the interface settings from the Web console or CLI.

---

5. Check the LEDs next to the Ethernet ports (Figure 2-19).
  - If the LINK LEDs light, the device is properly connected.
  - The SPEED LED indicates 100 or 1000 Mbps connectivity. To verify the interface speed, use the front panel or the CLI.



**Figure 2-19** Checking the Link LEDs for the SM-500

The installation is complete. You can now run Quick Setup, as described in [“Running Quick Setup through the Web Console” on page 48](#).

## Running Quick Setup through the Web Console

After starting the Peribit device and configuring network settings, the next step is to run the Quick Setup program. The first time you log in to the Web console, the Quick Setup program starts automatically and guides you through the required configuration steps for Inline Mode (active operation) or Profile Mode (passive operation). All settings made during Quick Setup can be changed later.

You can log in to the Web console from any workstation in your network. The Web console supports Microsoft Internet Explorer versions 5.5, and 6.0, and Netscape Communicator 7.x. Data is securely transmitted through HTTPS.

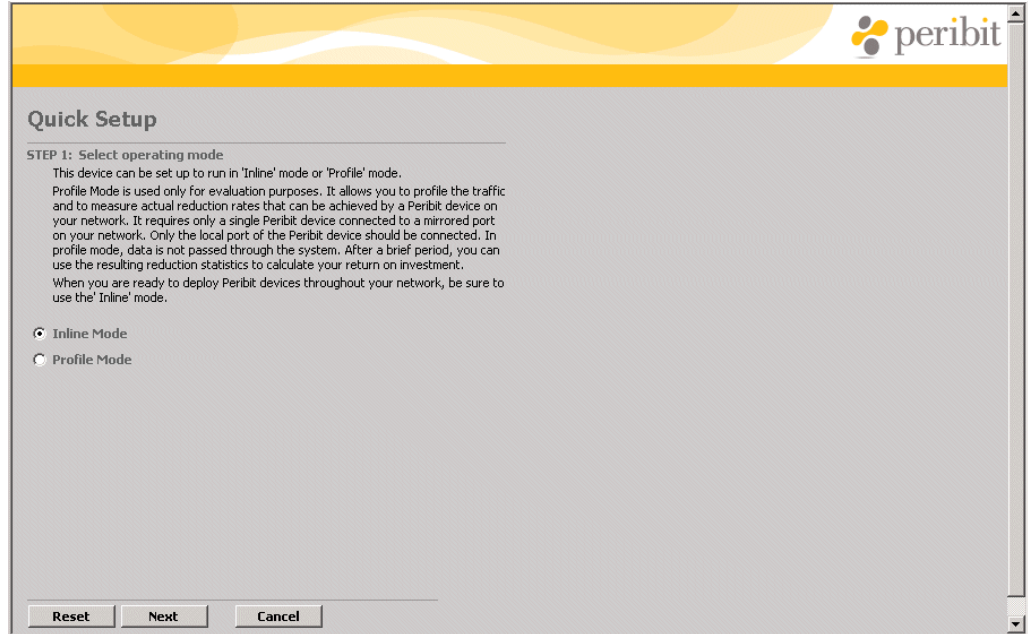
To run Quick Setup from the Web console:

1. From a workstation in your network, start your web browser and enter the following URL:

*<https://<IP address of the Peribit device>>*



2. Depending on your browser settings, the Security Alert dialog box may appear, click **Yes** to proceed.
3. In the Enter Network Password dialog box, type **admin** for the user name and **peribit** for the password. You will be asked to change the default password at the end of Quick Setup.



**Figure 2-20** Select Inline or Profile Mode

Select the Sequence Reducer's operating mode:

Inline Mode	Active operation where the Peribit device can begin reducing data, accelerating TCP applications, and managing bandwidth. Also applies to "off path" deployments.
Profile Mode	Passive operation where the Peribit device can calculate potential data reduction for all traffic, individual applications, and specific remote subnets. You can view the statistics on the standard reports. The actual traffic is not affected.
<p><b>Note:</b> To use Profile Mode, the device's Local interface must be connected to a mirrored port on the switch, and the Remote interface must be disconnected. Do not enable Profile Mode on a Peribit device that is installed in the data path.</p> <p>For more information about setting up and using a Peribit device in Profile Mode, refer to <a href="#">"Peribit Profile Mode" on page 359</a>.</p>	

---

**CAUTION:**Enabling Profile Mode disables the Remote interface. If the Peribit device is installed in the data path, all transmission through the device will stop.

---

If you select Profile Mode, only the pages shown in Steps 5, 7, and 9 are displayed.

4. Click **Next** to open the Registration Server Setup page (Figure 2-21).

The screenshot shows the 'Quick Setup' page in the Peribit web console. The page has a yellow header with the Peribit logo. The main content area is titled 'Quick Setup' and contains the following text:

**STEP 2: Set up a registration server**  
 Peribit devices exchange information with one another through a designated registration server. For security reasons, Peribit devices must provide a password in order to communicate with the registration server.

If this device is to be the registration server, then a password must be set.  
 If this device is NOT the registration server, then the address of the registration server must be entered along with the registration server password.

There are two radio button options:

- ☒ **Designate this device as the registration server**
  - Set password: [text input field]
  - Verify password: [text input field]
- ☐ **Direct this device to an existing registration server**
  - Registration server: [text input field] IP address
  - Enter password: [text input field]

Below these options is a checkbox:

- ☐ **Delay reduction tunnel formation**  
 Delay the formation of reduction tunnels until endpoints have been configured using the 'Endpoints' page under the 'REDUCTION' tab.

At the bottom of the form are three buttons: **Back**, **Next**, and **Cancel**.

**Figure 2-21 Registration Server Setup**

In Inline Mode, one Peribit device must be designated as a registration server. Each Peribit device periodically contacts the registration server to find the other devices in the same Peribit community. Two Peribit devices can reduce and assemble data for each other only if they belong to the same community. Initially, all devices reporting to the same registration server are in the Default community. For more information, refer to [“Configuring Registration Servers and Communities” on page 76](#).

To specify the registration server, do one of the following:

- a. Select **Designate this device as the registration server**, and enter a registration server password in both fields. The password is used to authenticate each device, and should be different from the administrator password.
- b. Select **Direct this device to an existing registration server**, and enter the IP address and password of the current (or future) registration server.

---

**NOTE:** If the registration server has not been installed, you can enter its IP address and password in advance.

---

Optionally, select **Delay reduction tunnel formation** to prevent this device from reducing or assembling data until you enable reduction tunnel formation. For more information, refer to [“Configuring Endpoints for Reduction Tunnels” on page 123](#).

5. Click **Next** to open the Time Setup page (Figure 2-22).

**Quick Setup**

STEP 3 : Set the time

The time must be set on the Peribit device in order to display the correct time in reports. If you have access to a time (NTP) server, the Peribit device can be synchronized with it. To configure NTP server, please visit the 'Time' page under 'Setup' tab after completing Quick Setup.

Local Time: Time: 08:43 HH:MM AM PM  
Date: 9/15/2003 MM/DD/YYYY

Time Zone: (GMT -08:00) Pacific Time (US and Canada), Tijuana

Daylight Saving: ☐ Automatically adjust time for daylight saving

Back Next Cancel

**Figure 2-22 Set the Time for the Sequence Reducer**

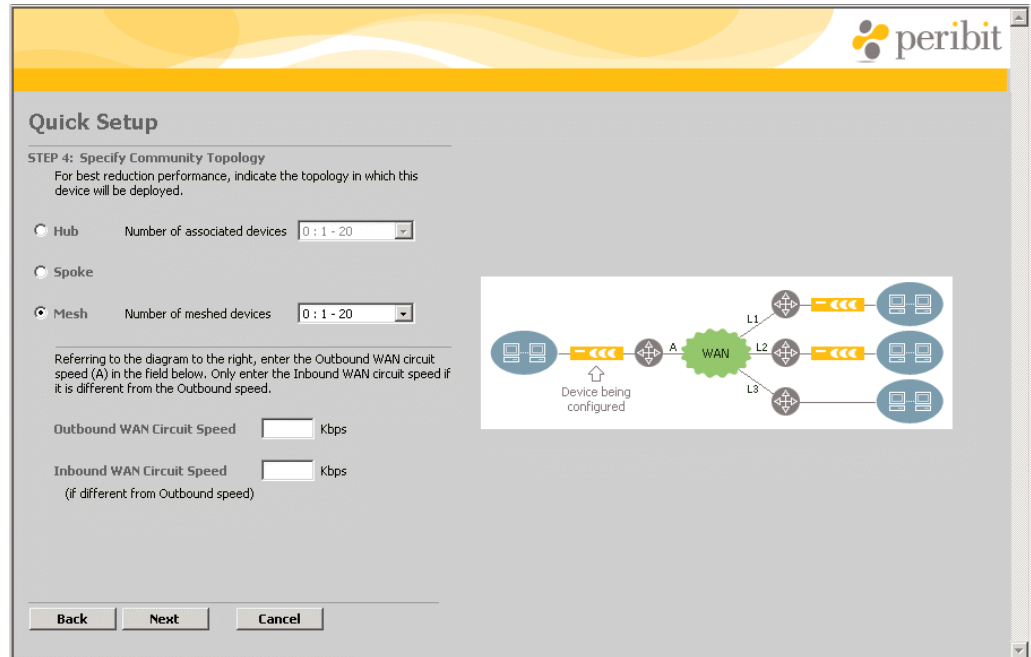
If the time settings are not correct, enter the current date and time, and select the local time zone for the Peribit device. If applicable, select the **Daylight Saving** checkbox.

---

**NOTE:** If you use an NTP server to set device time, you can configure the Peribit device to use the NTP server after completing the Quick Setup. For more information, refer to [“Configuring Time Settings” on page 63](#).

---

6. Click **Next** to open the Specify Community Topology page (Figure 2-23).



**Quick Setup**

**STEP 4: Specify Community Topology**  
For best reduction performance, indicate the topology in which this device will be deployed.

☐ Hub Number of associated devices: 0 : 1 - 20

☐ Spoke

☒ Mesh Number of meshed devices: 0 : 1 - 20

Referring to the diagram to the right, enter the Outbound WAN circuit speed (A) in the field below. Only enter the Inbound WAN circuit speed if it is different from the Outbound speed.

Outbound WAN Circuit Speed:  Kbps

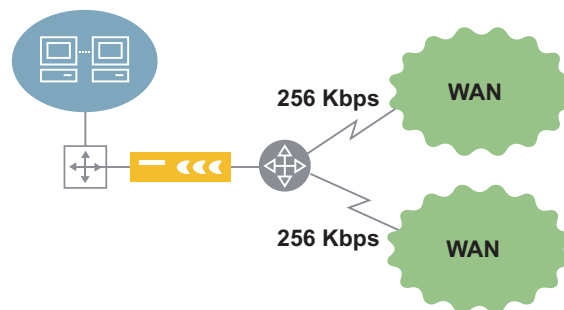
Inbound WAN Circuit Speed:  Kbps  
(if different from Outbound speed)

**Figure 2-23 Specify Community Topology**

In Inline Mode, select the topology setting that best describes the Peribit device's relationship to the other devices in the same community. If you specify **Hub** or **Mesh**, select a range for the number of devices in the Peribit community. The correct topology setting ensures that the device's resources are used efficiently, as described in [“Setting Community Topology Parameters” on page 97](#).

For a Sequence Mirror device, specify the following WAN circuit speeds. This allows Network Sequence Mirroring (NSM) to be used automatically for data reduction with remote Sequence Mirror devices in the same community.

- **Outbound WAN Circuit Speed.** The sum of the speeds for all the outbound circuits on the adjacent router that carry traffic from the Peribit device.
- **Inbound WAN Circuit Speed.** Usually the same as the outbound WAN circuit speed. However, in the example in Figure 2-24, the outbound WAN circuit speed is 512 Kbps, while the inbound circuit speed is 256 Kbps.



**Figure 2-24 Different Inbound and Outbound WAN Circuit Speeds**

7. Click **Next** to open the Advertise Local Subnet page (Figure 2-25).

**Quick Setup**

STEP 5: Advertise local subnet

☐ Advertise 192.168.0.0/255.255.0 to other Peribit devices so that data destined for this subnet will be targeted for reduction.

If this option is not checked, after completing Quick Setup you should use the 'Reduction Subnets' page under the 'REDUCTION' tab to select a subnet to advertise.

You may enter a name to help you identify this device

Device name:  Optional

**Figure 2-25 Advertise Local Subnet and Enter a Device Name**

By default, the local subnet where the Peribit device is installed is not advertised to the other devices in the Peribit community. As a result, data destined for this subnet is not reduced by other Peribit devices in the path. To advertise the local subnet immediately, select the **Advertise** checkbox (Inline Mode only). To advertise the local subnet after you complete the Quick Setup, refer to [“Advertising Reduction Subnets” on page 126](#).

Optionally, enter a unique name for the device (up to 30 characters) in the **Device name** field.

---

**NOTE:** If you plan to use CMS to manage your Peribit devices, entering a unique name for each device is strongly recommended.

---

8. Click **Next** to open the License Key page (Figure 2-26).

**Quick Setup**

**STEP 6: License key**

The maximum throughput of this device is determined by the license key. A license key can be obtained by calling Peribit Networks at 866-737-4248 (866-PERIBIT). Please be prepared to provide the product serial number shown below.

Serial number:

License key:

If you have an Internet connection, you can take advantage of Peribit Networks' Online License Service by clicking this button. [Online Service...](#)

If you do not enter a license key, this device will operate normally for 30 days. It will then stop assembling/reducing data if a valid license key has not been entered.

[Back](#) [Next](#) [Cancel](#)

**Figure 2-26 Entering a License Key for the Peribit Device**

In Inline Mode, each Peribit device requires a license key, which is based on its serial number. By default, each device has a 30-day evaluation license. When the evaluation license expires, data will pass through the device without reduction.

Serial number	If the serial number is not shown, get the “S/N” number from the back of the Peribit device.
License key	Enter your permanent license key or leave this field blank to use the 30-day evaluation license. When the evaluation license expires, data will pass through the device without reduction.  To obtain a permanent license key, refer to <a href="#">“Entering a Permanent License Key”</a> on page 64.

9. Click **Next** to open the Change Administrator Password page (Figure 2-27).

**Figure 2-27 Change Administrator Password**

Enter a new Administrator password in the **New password** and **Verify new password** fields, and then click **Finish**. You will be prompted to log in using the new password.

---

**NOTE:** If you deselect the “automatic save” option, the configuration settings will be lost the next time you restart the Peribit device, and Quick Setup will have to be run again. You can save the configuration later, as described in [“Saving the Device Configuration” on page 227](#).

---

Initial configuration is complete. Refer to the next section for a list of key configuration tasks.

## Post-Installation Tasks

After you run Quick Setup, you can continue configuring the Peribit device through the Web console or through the command line interface (CLI).

- To use the Web console, refer to [Chapter 3, “Configuring Basic Setup Policies”](#).
- To use CLI, refer to [Chapter 11, “Using the Command Line Interface \(CLI\)”](#).

Be sure to review the following key configuration tasks. The references are to instructions for using the Web console.

- Configure the local routes for the device, as described in [“Configuring Local Routes” on page 67](#). To use RIP and/or OSPF to discover routes, you need the following information for your network:
  - OSPF Area ID, and the password or the MD5 authentication key and key ID
  - RIP password (if any)
- Select the local subnets that you want to advertise to other Peribit devices for data reduction, as described in [“Advertising Reduction Subnets” on page 126](#).

- Review the available security features, such as limiting operator access to specific IP addresses or subnets, as described in [“Configuring AAA” on page 80](#).
- Review the application definitions provided and add any new ones needed for your network, as described in [“Managing Applications” on page 90](#).
- Configure inbound and outbound bandwidth management, as described in [“Applying Quality of Service \(QoS\) Policies” on page 145](#).
- Enable Packet Flow Acceleration (PFA) for TCP applications, as described in [“Configuring Packet Flow Acceleration” on page 177](#).

## Where to Go Next

After installing the Sequence Reducer and running Quick Setup, proceed to one of the following chapters depending on your preference for configuring the device:

- [Chapter 3, “Configuring Basic Setup Policies”](#).
- [Chapter 11, “Using the Command Line Interface \(CLI\)”](#).



## Chapter 3    Configuring Basic Setup Policies

---

The following topics describe the basic setup procedures:

- [“Using the Web Console” in the next section](#)
- [“Configuring Basic Setup Policies” on page 59](#)
- [“Configuring AAA” on page 80](#)
- [“Managing Applications” on page 90](#)

---

**NOTE:** You can also set up a Peribit device through the Command Line Interface (CLI). Refer to [Chapter 11, “Using the Command Line Interface \(CLI\)”](#) for more information.

---

### Using the Web Console

The SRS Web console is a portal for accessing and configuring a Peribit device. Using the Web console, you can log in to a Peribit device from anywhere in your network and securely access configuration and management information, as well as reduction, acceleration, and QoS statistics.

The SRS Web console supports the Microsoft Internet Explorer 5.5 and 6.0 browser, and Netscape Communicator 7.x (browser privacy settings must be configured to accept cookies). The SRS Web console is designed to be viewed at 1024 x 768 pixels. To ensure secure transmission of configuration and management data, the SRS Web console uses the Secure Sockets Layer protocol (SSL/HTTPS).

### Logging In to a Peribit Device

To log in to a Peribit device through the SRS Web console:

1. Using a supported Web browser, enter the IP address of a Peribit device as follows:  
`https://<IP address of a Peribit device>`
2. Depending on your browser settings, a Security Alert dialog box may appear, click **Yes** to proceed.
3. In the Enter Network Password dialog box, type your user name and password.

---

**NOTE:** When a new Peribit device is accessed for the first time, use **admin** and **peribit** for the user name and password, and run Quick Setup (refer to [“Running Quick Setup through the Web Console” on page 48](#)).

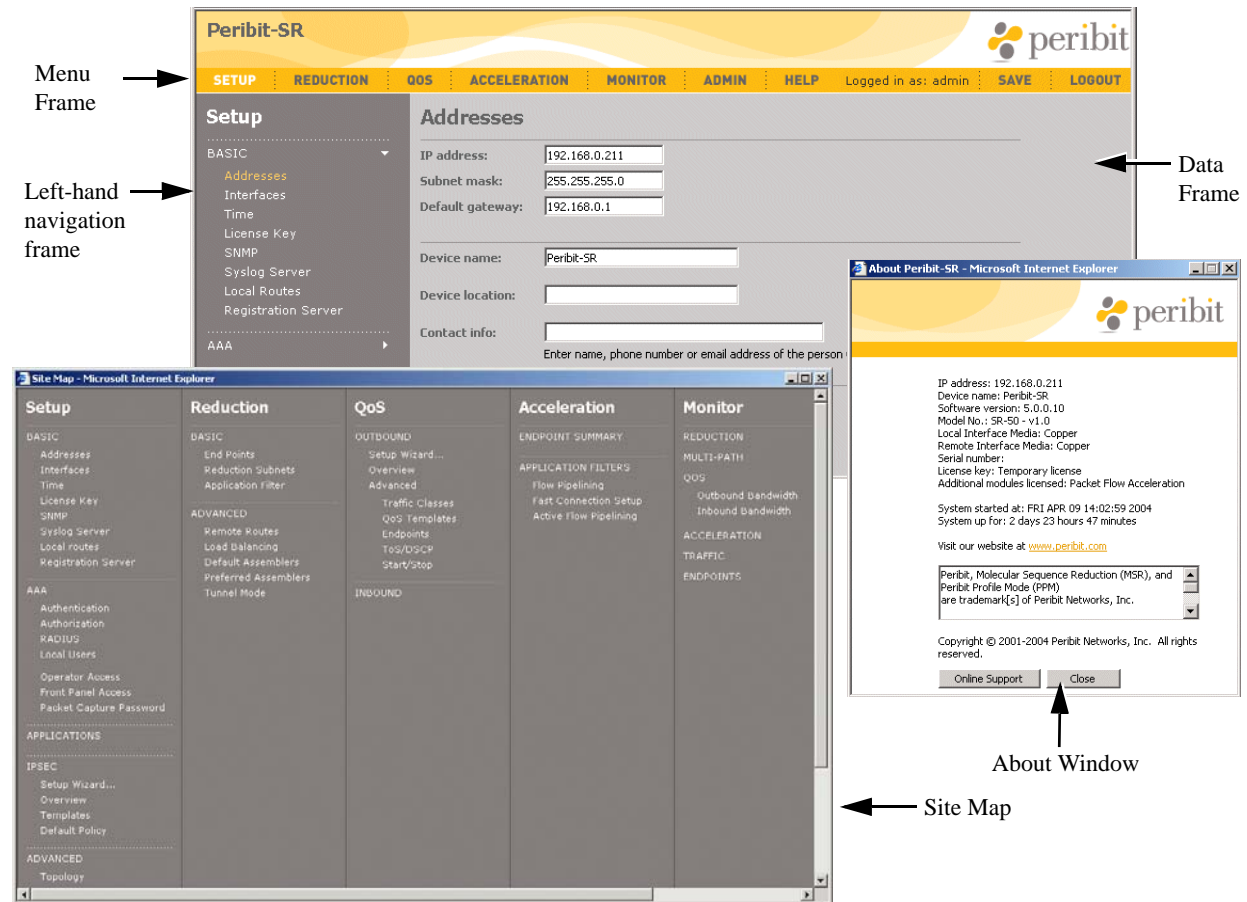
---

4. Continue to the next section for a description of the SRS Web console interface.

To log out of the SRS Web console, click **LOGOUT** in the menu frame of any page. Users are logged out automatically if their sessions are inactive for the session timeout time (default is 30 minutes).

## Understanding the SRS Web Console Interface

The SRS Web console contains a menu frame of seven administrative functions, a left-hand navigation frame of various sub-menu items, and a data frame for configuring and viewing policies and performance data.



**Figure 3-1 SRS Web Console Interface**

Click **HELP > About** to view hardware and software information for the Peribit device, such as the IP address, the software and hardware versions, and the license key assigned to the device. Click **HELP > Site Map** to view a list of the options available under each menu frame selection.

## Using Special Characters

In general, use only letters, numbers, and blanks when assigning names to devices and other objects. If necessary, you can also use the following special characters:

# \$ & \_ - + . ( ) ' ,

**NOTE:** You can also use colons (:), but not in device names.

## Configuring Basic Setup Policies

The following topics describe the basic configuration procedures:

- [“Configuring Device Address and Contact Information” on page 59](#)
- [“Configuring the Interface Settings” on page 60](#)
- [“Configuring 802.1Q VLAN Support” on page 62](#)
- [“Configuring Time Settings” on page 63](#)
- [“Entering a Permanent License Key” on page 64](#)
- [“Enabling SNMP” on page 65](#)
- [“Enabling Syslog Reporting” on page 66](#)
- [“Configuring Local Routes” on page 67](#)
- [“Configuring Registration Servers and Communities” on page 76](#)

### Configuring Device Address and Contact Information

The Peribit device’s IP address, subnet mask, and default gateway are specified during the installation process. The Addresses page of the Web console lets you change these settings, as well as add device and administrator contact information.

To change the network address and contact information:

1. Click **SETUP** in the menu frame.

**Figure 3-2** Configuring Network Address and Contact Information

2. To change the network information for the device (the IP address, subnet mask, or default gateway), enter the new information in the appropriate fields.

---

**NOTE:** If you change the IP address or subnet mask, you must reboot the device. In addition, if this device is a registration server, you must first transfer the registration server to another Peribit device before changing the IP address (refer to [“Configuring Registration Servers and Communities” on page 76](#)).

---

3. Enter a device name (up to 30 characters), location, and administrator contact information in the appropriate fields. Do not use colons (:), asterisks (\*) question marks (?) or angle brackets (< >) in device names.

Device name changes are propagated to the registration server the next time the device checks in with the registration server for updates.

4. Click **Submit** to activate the changes, or click **Reset** to discard them.
5. To retain your changes when the device is restarted, click **SAVE** in the menu frame.

## Configuring the Interface Settings

Each Peribit device has two Network Interface Controllers (NICs) for its Local and Remote interfaces. By default, these interfaces are set to auto-negotiate the link speed and mode (half- or full-duplex).

---

**NOTE:** The SR-15, SR-20, SR-50, and SM-250 have two 10/100 NICs. The SR-55, SR-80, SR-100, and SM-500 have two 10/100/1000 NICs. The fiber SR-80 and SR-100 support only 1 Gigabit speeds at full-duplex.

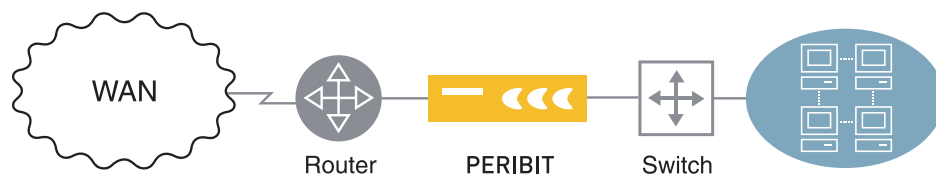
---

The Web console lets you do the following:

- View the status, MAC address, and negotiated speed and mode of each interface.
- Run a test to detect a mode mismatch on the Local or Remote interface, and manually configure the speed and mode when necessary.

By default, a passive test runs periodically and displays a message above the menu frame if a mismatch is detected (refer to [“Configure Interface Command” on page 271](#)). The passive test can detect a mismatch only when data is sent and received at the same time.

In addition, you can enable high-availability support so that when a failure is detected on one interface, the other interface is turned off for 15 seconds. This allows the switch or router to detect the failure, and ensures that the routing mechanisms work as expected (Figure 3-3).



**Figure 3-3 Using the High Availability Support Feature**

- If the switch fails, the Remote interface is turned off so that the router detects the loss of connectivity with the switch.
- If the router fails, the Local interface is turned off so that the switch detects a loss of connectivity with the router.

On the SR-80 and SR-100, you can also disable the hardware passthrough so that the router detects the loss of traffic if the Peribit device fails (refer to [“Configuring Network Settings for the SR-80 and SR-100” on page 40](#)).

To view and/or configure the interface settings:

1. Click **SETUP** in the menu frame, and then click **Interfaces** in the left-hand navigation frame.

The screenshot shows the Peribit-SR web interface. The top navigation bar includes tabs for SETUP, REDUCTION, OOS, ACCELERATION, MONITOR, ADMIN, and HELP. The left sidebar shows a tree view with 'Setup' expanded, containing 'BASIC' (Addresses, Interfaces, Time, License Key, SNMP, Syslog Server, Local Routes, Registration Server), 'AAA', 'APPLICATIONS', 'IPSEC', and 'ADVANCED'. The main content area is titled 'Interfaces' and shows settings for 'LOCAL' and 'REMOTE' interfaces. For each, there are fields for Status, MAC address, and Speed (Auto/Manual with a dropdown). Below these are checkboxes for 'Local link failure propagation' and 'Remote link failure propagation' with explanatory text. At the bottom are buttons for 'Submit', 'Reset', 'Test Settings...', and '802.1q...'.

**Figure 3-4 Configuring Interface Speed and Duplex Mode Settings**

The Status fields show the current speed and mode parameters for each interface. By default, the Local and Remote interfaces are set to auto-negotiate. In addition, each interface's Media Access Control (MAC) address is listed.

2. To change the speed and mode for the Local or Remote interfaces, select **Manual**, and then choose a speed and mode setting (such as **100 half-duplex**).
3. Click the **Local link failure propagation** check box to disable the Remote interface when a switch failure is detected. Click the **Remote link failure propagation** check box to disable the Local interface when a router failure is detected. This allows the switch or router to detect the failure, and ensures that the routing mechanisms work as expected. After 15 seconds, the disabled interface is reactivated.
4. Click **Submit** to activate the changes, or click **Reset** to discard them.
5. To test for mismatched duplex settings between the Peribit device and another device, click **Test Settings**, select the **Local** or **Remote** interface, enter the IP address of any device on the selected interface segment, and click **Submit**. The test results are displayed in a popup window.
6. To retain your changes when the device is restarted, click **SAVE** in the menu frame.

## Configuring 802.1Q VLAN Support

To enable reduction of VLAN traffic that conforms to the IEEE 802.1Q specification:

1. Click **SETUP** in the menu frame, and then click **Interfaces** in the left-hand navigation frame.
2. Click **802.1q**, select **Enable 802.1q**, and specify the following:
  - **Native VLAN ID.** Enter the default VLAN ID (1 through 4095) used for untagged frames in the VLAN environment where the Peribit device is installed.
  - **VLAN ID.** Enter a VLAN ID (1 through 4095) for the port where the Local interface of the Peribit device is connected. On ports that have multiple VLANs, specify the VLAN that has the largest number of hosts. Note that the Peribit device resides on one VLAN, but can reduce traffic for all the VLANs.
  - **Preserve VLAN ID on output packets.** Select the check box to preserve the VLAN ID in the header of reduced output packets if you have routers that use the VLAN ID for QoS, MPLS, or other functions.

Click **Submit** to activate the changes, or click **Reset** to discard them.

When a Peribit device issues an ARP for a destination, only the router can respond with the appropriate VLAN tag. Since the router is on the WAN side, the local subnets appear to be WAN-side subnets and, by default, are excluded from the Reduction Subnets page and cannot be advertised for reduction.

To include WAN-side routes on the list of reduction subnets, you must enter the following CLI commands:

```
config reduction-subnet set wan-reduction-subnet on
commit
```

After you configure the local routes (refer to [“Configuring Local Routes” on page 67](#)), verify that the appropriate subnets are discovered and advertised (refer to [“Advertising Reduction Subnets” on page 126](#)). Since both LAN and WAN-side subnets will be shown on the Reduction Subnets page, be sure to advertise only the true LAN-side subnets.

3. To retain your changes when the device is restarted, click **SAVE** in the menu frame.

## Configuring Time Settings

Peribit devices support the Network Time Protocol (NTP). If your network uses NTP, you can specify a primary and secondary NTP server to maintain the current time. You can also set the time manually. Entries in the system log files include the current time to assist with device administration.

To configure the time settings:

1. In the Setup page, click **Time** in the left-hand navigation frame.

The screenshot shows the Peribit-SR web interface. The top navigation bar includes links for SETUP, REDUCTION, QOS, ACCELERATION, MONITOR, ADMIN, and HELP. The user is logged in as 'admin'. The left-hand navigation menu is expanded, showing the 'Setup' section with sub-items: BASIC, Addresses, Interfaces, Time (highlighted), License Key, SNMP, Syslog Server, Local Routes, and Registration Server. The main content area is titled 'Time' and contains the following configuration options:

- ☐ Use NTP Server: Primary: [IP address], Secondary: [IP address (optional)]
- ☒ Enter Local Time: Time: 02:10 HH:MM, AM/PM, Date: 4/12/2004 MM/DD/YYYY
- Time Zone: ((GMT -08:00) Pacific Time (US and Canada), Tijuana)
- Daylight Saving: ☐ Automatically adjust time for daylight saving

At the bottom, there are 'Submit' and 'Reset' buttons. A note states: 'If you want to preserve the changes of NTP Server, Time Zone, Daylight Saving, and Prime time, you must save the configuration to flash memory using the 'Save Configuration' page under the 'Admin' tab after submit.'

Figure 3-5 Configuring the Time Settings for a Device

2. Do one of the following:
  - If you have an NTP server in your network, select **Use NTP Server** and enter the IP address of the NTP server in the **Primary** field. A secondary NTP server is optional.
  - If you do not have an NTP server, select **Enter Local Time** and enter the current time and date.
3. Select the time zone of the device, and then select **Automatically adjust time for daylight savings** if applicable.
4. Click **Submit** to activate the changes, or click **Reset** to discard them.
5. To retain your changes when the device is restarted, click **SAVE** in the menu frame.



## Entering a Permanent License Key

Each Peribit device requires a permanent license key for operation. The license key determines the licensed modules and throughput for the device, and properly registers the product with Peribit Networks. By default, each device has a 30-day evaluation license. When the evaluation license expires, data will pass through without reduction.

The license key is based on its serial number. The serial number is displayed in the About box and License Key page of the Web console, and on the back of the device. Using the serial number and the Right To Use (RTU) key(s) that were e-mailed to you, you can obtain a permanent license key from Peribit's Online License Key server, as described here, or by going to:

<http://license.peribit.com>.

The basic RTU key specifies the licensed speed and level of support for the device. A separate RTU is needed to enable IPSec encryption. If you do not enter an RTU key, the device is licensed for the base speed with no customer support and no encryption. If you lose the license key, you can use the License Key server to retrieve your current license key.

---

**NOTE:** If you do not have Internet access, please call Peribit Support to obtain a license key.

---

To enter a license key:

1. In the Setup page, click **License Key** in the left-hand navigation frame.

The screenshot shows the Peribit-SR Web Console interface. The top navigation bar includes links for SETUP, REDUCTION, QOS, ACCELERATION, MONITOR, ADMIN, and HELP. The user is logged in as 'admin'. The left-hand navigation frame is expanded to show the 'Setup' section, with 'License Key' selected. The main content area displays the 'License Key' page. It shows the current license key as 'Temporary license', maximum throughput as 'Unlimited', and expiration as '19 days: 12 hours: 52 minutes'. Below this, there is a section for entering a new license key, with fields for 'Serial number' and 'License key'. A button labeled 'Online Service...' is present. At the bottom, there are 'Submit' and 'Reset' buttons.

**Figure 3-6** Entering a License Key through the Web Console

The License Key page displays the current status of the Peribit license, including the maximum licensed throughput for the device.



2. If you have obtained a registered license key, enter it the **License key** field. If you do not have a registered license key, you can obtain one as follows:
  - a. Click **Online Service**.  
A new browser window opens at *http://license.peribit.com*
  - b. Enter your contact information and the device serial number, and click **Submit**.
  - c. Enter an RTU key for the desired device speed and level of support, and click **Yes**. If you omit the RTU key and click **No**, the device is licensed for the base speed with no support.
  - d. Copy the displayed license key into the **License key** field in the Web console.
3. Click **Submit** to activate the changes, or click **Reset** to discard them.

## Enabling SNMP

Peribit devices provide the following SNMP support:

- SNMP version 2
- Peribit Enterprise Management Information Base (MIB)
- MIB II, Interface Group public objects

---

**NOTE:** SNMPv2-compatible utilities are needed to query the 64-bit counters in the Peribit MIB.

---

The Peribit Enterprise MIB can be used to view performance statistics from a Network Management System (NMS). In addition, the SNMP traps can be sent to the NMS and other network devices. For a description of the SNMP traps, refer to [Appendix C, “SNMP Traps and Syslog Messages”](#) on page 339.

To enable SNMP:

1. In the Setup page, click **SNMP** in the left-hand navigation frame.

The screenshot shows the Peribit-SR web interface. The top navigation bar includes links for SETUP, REDUCTION, OOS, ACCELERATION, MONITOR, ADMIN, and HELP. The left-hand navigation pane is expanded to show the 'Setup' section, with 'SNMP' selected. The main content area is titled 'SNMP' and contains the following configuration fields:

- SNMP Enabled:** A checkbox that is checked, with the label 'Yes'.
- Read Community String:** A text input field containing masked characters (asterisks).
- Write Community String:** A text input field containing masked characters (asterisks).
- Trap Enabled:** A checkbox that is unchecked, with the label 'No'.
- Trap Community String:** A text input field containing masked characters (asterisks).
- Trap Destinations:** A large text area for entering IP addresses, with a placeholder text 'Enter IP addresses, one per line.'
- Authentication Failure Trap Enabled:** A checkbox that is unchecked, with the label 'No'.

At the bottom of the configuration area are two buttons: 'Submit' and 'Reset'.

**Figure 3-7 Enabling SNMP**

2. Select the **SNMP Enabled** check box to enable SNMP, and then enter the Read and Write Community Strings used by the NMS to access SNMP data on the device. The default community strings are **public** and **private**.
3. Select the **Trap Enabled** check box to generate SNMP traps (version 2 traps only). Next, enter a Trap Community String and the IP addresses (one per line) where the traps are sent. The default community string is **trap community**.
4. Select the **Authentication Trap Enabled** check box to generate traps for incorrect logins and unauthorized user access attempts.
5. Click **Submit** to activate the changes, or click **Reset** to discard them.
6. To retain your changes when the device is restarted, click **SAVE** in the menu frame.

## Enabling Syslog Reporting

Peribit devices can send Syslog messages to up to five Syslog servers. A Syslog server allows you to centrally log and analyze configuration events and system error messages such as interface status, security alerts, and environmental conditions. For a description of Syslog messages, refer to [Appendix C, “SNMP Traps and Syslog Messages” on page 339](#).

To enable Syslog reporting:

1. In the Setup page, click **Syslog Server** in the left-hand navigation frame.

The screenshot shows the Peribit-SR web interface. The top navigation bar includes links for SETUP, REDUCTION, QOS, ACCELERATION, MONITOR, ADMIN, and HELP. The left-hand navigation menu is expanded, showing options like BASIC, Addresses, Interfaces, Time, License Key, SNMP, Syslog Server (highlighted), Local Routes, and Registration Server. The main content area is titled 'Syslog Server' and contains the following configuration options:

- Syslog enabled:** A checkbox labeled 'Yes'.
- Syslog servers:** A text area for entering IP addresses, with a note: 'Enter IP addresses, one per line with a maximum of 5 servers.'
- Syslog message severity:** Three checkboxes: 'Critical' (checked), 'Error' (checked), and 'Informational' (unchecked). A note states: 'Check message severity levels you want reported to the syslog server.'

At the bottom of the configuration area are two buttons: 'Submit' and 'Reset'.

**Figure 3-8 Enabling Syslog Reporting**

2. Select the **Syslog enabled** check box to enable Syslog reporting, and then enter the IP addresses of up to five Syslog servers (one per line).
3. Select the severity levels of the messages sent to the Syslog server:
  - **Critical:** Critical error messages about software or hardware malfunctions.
  - **Error:** Error message, such as License expired.
  - **Informational:** Informational messages, such as reload requests and low-process stack messages.

4. Click **Submit** to activate the changes, or click **Reset** to discard them.
5. To retain your changes when the device is restarted, click **SAVE** in the menu frame.

## Configuring Local Routes

Local routes are the routes defined in the Peribit device's routing table. When you first install a Peribit device, the routing table contains the local subnet where the device is installed, a route to the default gateway (the default route), and the loopback address. To identify more routes, you can:

- Add static routes manually
- Add dynamic routes using one of the following methods:
  - Enable the Open Shortest Path First (OSPF) and/or the Routing Information Protocol (RIPv1, RIPv2)
  - Periodically poll the routing table of a Cisco router
  - Import a file of routes from an FTP server

A total of 8192 IP routes (static and dynamic) are supported (the SR-15 is limited to 1000). Also, each Peribit device can balance the load across up to four routers that have equal cost paths to the same destination.

If a subnet's gateway is on the LAN side of the Peribit device (as determined by ARP), the subnet is added to the list of reduction subnets. Reduction subnets can then be advertised so that other devices in the Peribit community can reduce and accelerate traffic sent to those subnets (refer to [“Advertising Reduction Subnets” on page 126](#)). By default, only the subnets you select are advertised.

---

**NOTE:** In some environments, such as VLAN, some routes on the Local interface may be discovered only on the Remote interface. To advertise these subnets, you must enable the WAN reduction subnet option through the CLI to display all routes on the list of reduction subnets (refer to [“Configure Reduction Subnets Command” on page 301](#)).

---

To configure local routes:

1. In the Setup page, click **Local Routes** in the left-hand navigation frame.

**Peribit-SR**

SETUP REDUCTION QOS ACCELERATION MONITOR ADMIN HELP Logged in as: admin SAVE LOGOUT

**Setup**

BASIC

- Addresses
- Interfaces
- Time
- License Key
- SNMP
- Syslog Server
- Local Routes**
- Registration Server

AAA

APPLICATIONS

- IPSEC

ADVANCED

**Local Routes**

OSPF: Stopped

RIP: Stopped

Router Polling: None

3 local routes are defined on this Peribit device

IP Address	Subnet Mask	Gateway	Route Type
0.0.0.0	0.0.0.0	192.168.0.200	Static
127.0.0.1	0.0.0.0	127.0.0.1	Dynamic
192.168.0.0	255.255.255.0	192.168.0.211	Dynamic

☐ Static routes take precedence over dynamic routes

Submit Static... Dynamic... Import... Router Balancing...

**Figure 3-9** Configuring Local Network Routes

2. If you want static routes to take precedence over dynamically discovered routes, select the check box at the bottom of the page.

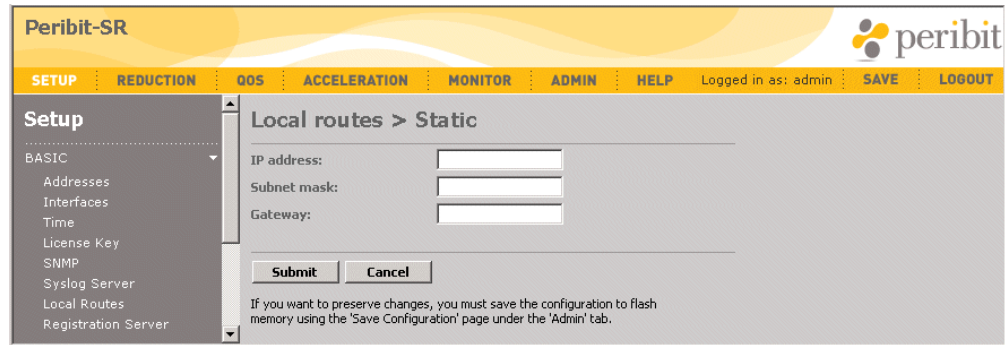
**NOTE:** The default route (0.0.0.0/0.0.0.0) and manually entered routes are static; all other routes are dynamic. The Peribit device is shown as the “gateway” for its local subnet, which is also labeled as dynamic.

3. To remove a manually-defined static route, click **Delete** next to the route. The route is also removed from the list of reduction subnets.
4. Refer to the following sections to add routes or enable router balancing:
  - “Adding Static Routes” in the next section
  - “Enabling RIP and OSPF Support” on page 70
  - “Enabling Route Polling” on page 71
  - “Importing a Routing Table from an FTP Server” on page 72
  - “Enabling Route-Based Router Balancing” on page 74
5. To retain your changes when the device is restarted, click **SAVE** in the menu frame.

## Adding Static Routes

To manually add static network routes:

1. On the Local Routes page, click **Static**.



**Figure 3-10** Adding a New Local Static Route

2. Enter the IP address, subnet mask, and the IP address of the gateway to this subnet.
3. Click **Submit** to activate the new route. The route is added to the list of local routes and reduction subnets. Note that ICMP redirect routes take precedence over static routes.

New static routes are advertised automatically to other Peribit devices, except when the WAN reduction subnets option is enabled (refer to [“Advertising Reduction Subnets”](#) on page 126).

## Enabling RIP and OSPF Support

If your network uses OSPF or RIP, you can enable these protocols on the Peribit device so that local routes are discovered dynamically.

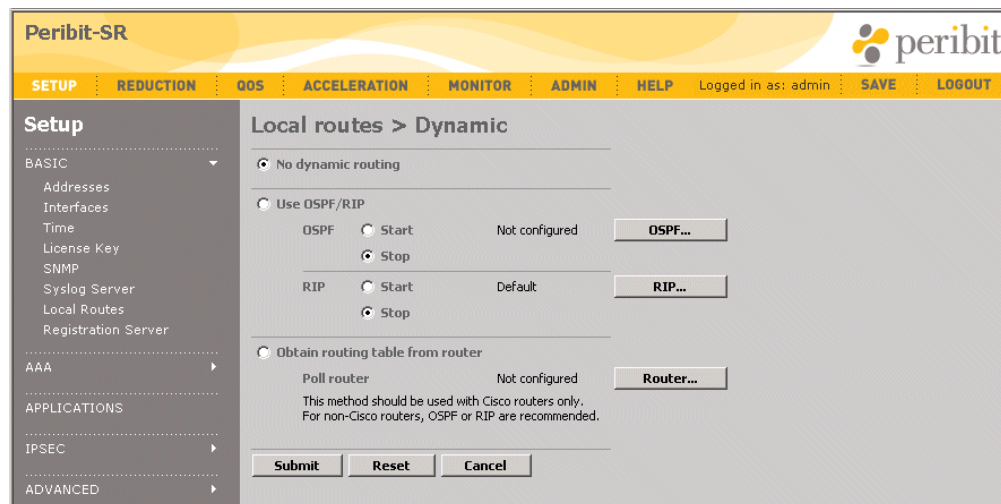
---

**NOTE:** If RIP or OSPF are enabled, routes added by ICMP redirects are ignored.

---

To enable RIP and/or OSPF routing:

1. On the Local Routes page, click **Dynamic**.



**Figure 3-11 Enabling Dynamic Routing**

2. Click **Use OSPF/RIP**.
3. To enable support for OSPF:
  - a. Click **OSPF** to configure the dynamic route settings.
  - b. On the Local routes > Dynamic > OSPF page, enter the Area ID for OSPF.
  - c. If your network uses OSPF authentication, select **Password** and enter the password (up to 8 characters), or select **MD5** and enter the key ID (0 to 255) and the MD5 key (up to 16 characters).
  - d. Click **Submit** on the Local routes > Dynamic > OSPF page.
  - e. On the Local routes > Dynamic page, select **Start** next to OSPF.
4. To enable support for RIP:
  - a. Click **RIP** to configure the dynamic route settings.
  - b. On the Local routes > Dynamic > RIP page, select the version of RIP used in your network (1 or 2).
  - c. If your network uses RIP authentication, select **Password** and enter the password (up to 15 characters).
  - d. Click **Submit** on the Local routes > Dynamic > RIP page.
  - e. On the Local routes > Dynamic page, select **Start** next to RIP.
5. Click **Submit** to start the enabled protocols.

All discovered routes are added to the list of local routes. Routes discovered on the Local interface are added to the list of reduction subnets, but they are not advertised automatically to the other Peribit devices. If the WAN reduction subnets option is enabled, all routes discovered on the Remote interface are also added to the list of reduction subnets (refer to [“Advertising Reduction Subnets” on page 126](#)).

### Enabling Route Polling

Routes can be discovered by periodically polling a Cisco router on the same subnet. The router must be configured to allow Remote Shell (*rsh*) access by the Peribit device. The *rsh* protocol allows a user or device to execute commands on a remote system without having to log in. Note that BGP routes are included only if you enable the BGP option using the CLI (refer to [“Configure Route Poll Command” on page 308](#)).

### Configuring a Cisco Router for Route Polling

The following sample Cisco router commands enable Remote Shell access for the Peribit device at IP address 172.16.5.3. The local and remote user names are “peribit” and “srdevice,” respectively. On the Peribit device, the names must be reversed (specify “peribit” as the remote name, and “srdevice” as the local name).

```
config terminal
ip rcmd rsh-enable
ip rcmd remote-host peribit 172.16.5.63 srdevice enable
no ip rcmd domain-lookup
end
```

### Configuring Route Polling

To periodically obtain the routing table from a Cisco router:

1. On the Local routes page, click **Dynamic**.
2. Click **Router** to configure the dynamic route import settings.

The screenshot shows the Peribit-SR web interface. The top navigation bar includes links for SETUP, REDUCTION, QOS, ACCELERATION, MONITOR, ADMIN, and HELP. The user is logged in as admin. The left sidebar shows a tree view with categories: BASIC (Addresses, Interfaces, Time, License Key, SNMP, Syslog Server, Local Routes, Registration Server), AAA, APPLICATIONS (IPSEC), and ADVANCED. The main content area is titled 'Local routes > Dynamic > Router'. It contains configuration fields for a Poll router and a Secondary router, each with IP address and Port (514) fields. There are also fields for Local user name and Remote user name, and a Polling interval set to 5 minutes. A note on the right states: 'The router must be configured to allow rsh access by the Peribit device. This method should be used only with Cisco routers.' Another note states: 'Specifying a secondary router is optional.' At the bottom are buttons for Submit, Reset, and Cancel.

Figure 3-12 Dynamically Obtaining a Routing Table from a Cisco Router

## 3. Specify the following information:

Poll router	Enter the IP address of a Cisco router and the port number used for <i>rsh</i> (the standard port is 514). <b>NOTE:</b> The IP address must be on the same subnet as the Peribit device.
Secondary router	Enter the IP address and port of a secondary Cisco router to be used when the primary router is unavailable.
Local user name	Enter a local user name that matches the <i>remote</i> user name specified on the Cisco router.
Remote user name	Enter a remote user name that matches the <i>local</i> user name specified on the Cisco router.
Protocol interval	Enter a polling interval to indicate how often the Cisco router is polled for routing updates. The default is five minutes

4. Click **Submit** to save the settings and return to the Local routes > Dynamic page.5. Select **Obtain routing table from router**, and click **Submit**.

All discovered routes are added to the list of local routes. Routes discovered on the Local interface are added to the list of reduction subnets, but they are not advertised automatically to the other Peribit devices. If the WAN reduction subnets option is enabled, routes discovered on the Remote interface are also added to the list of reduction subnets (refer to [“Advertising Reduction Subnets” on page 126](#)).

### Importing a Routing Table from an FTP Server

If you export a routing table from a Cisco router to a file, and then save the file to an FTP server, you can import the routes file to the Peribit device. The imported routes are the routes listed when you enter a “show ip route” command on the Cisco router. To import the routes file from a TFTP server, use the CLI command (refer to [“Import Route Table Command” on page 251](#)).

Note that the router must be in the same subnet as the Peribit device, and it is preferable to use the router that is connected to the Remote port.

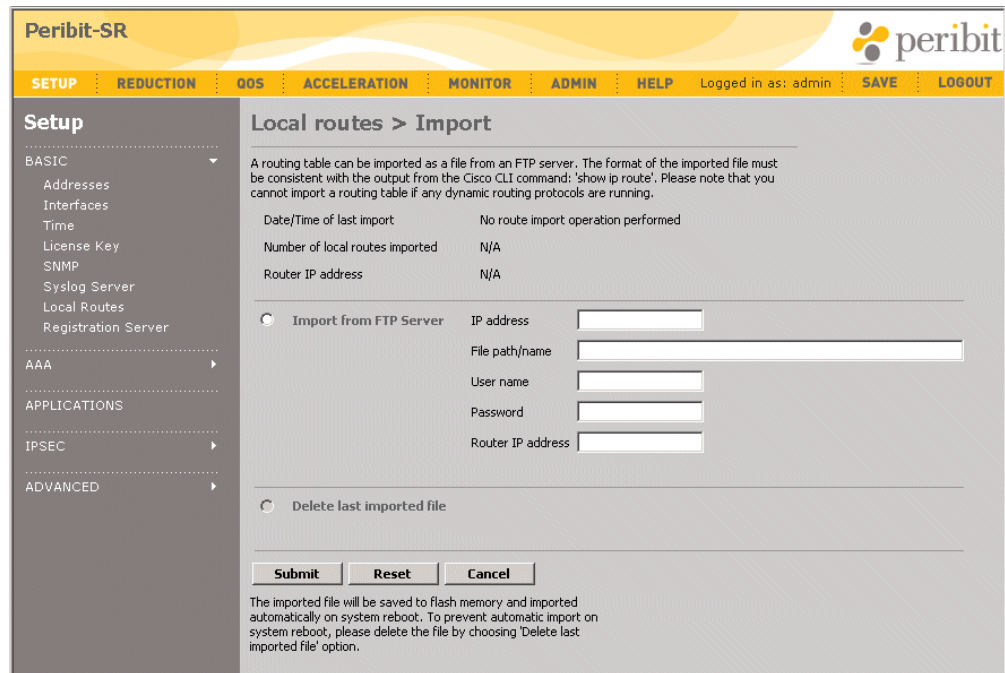
The following types of imported routes are recognized:

**B** - BGP routes, **C** - Connected routes, **D** - EIGRP routes, **E** - EGP derived, **I** - IGRP derived, **i** - IS-IS derived, **O** - OSPF derived, **R** - RIP derived, **S** - Static routes



To import routes from an FTP server:

1. On the Local Routes page, click **Import**.



**Figure 3-13 Importing a Routing Table**

2. In the Import from FTP Server section, enter the IP address of the FTP server, the directory path and file name of the file, the user name and password for the FTP server, and the Cisco router's IP address.

---

**NOTE:** If dynamic routing is enabled (RIP, OSPF, or route polling), you cannot import a routing table from an FTP server.

---

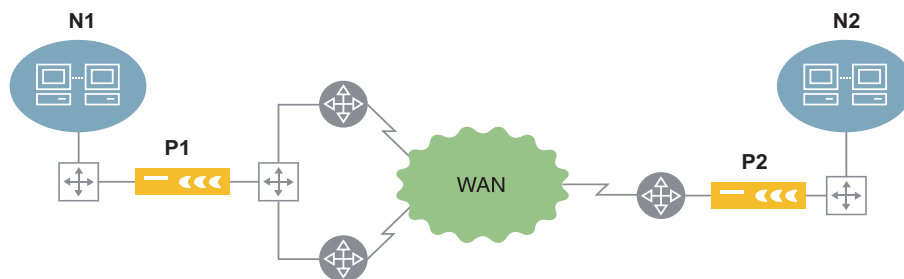
3. Select **Delete last imported file** if you do not want to reload the file from Flash memory the next time the device is restarted.
4. Click **Submit** to import the file and store a copy of it in flash memory. You return to the Local Routes page.

All discovered routes are added to the list of local routes. Routes discovered on the Local interface are added to the list of reduction subnets, but they are not advertised automatically to the other Peribit devices. If the WAN reduction subnets option is enabled, routes discovered on the Remote interface are also added to the list of reduction subnets (refer to [“Advertising Reduction Subnets” on page 126](#)).

## Enabling Route-Based Router Balancing

To balance the reduced traffic load across multiple routers, you can configure the Peribit device to distribute traffic across equal-cost paths (route-based balancing) and/or configure the local router to distribute traffic based on ToS values set by the Peribit device (ToS marking for router-based balancing). To configure ToS marking for router-based balancing, refer to [“Configure Route Command” on page 306](#).

Using route-based balancing, the Peribit device can distribute reduced traffic across up to four different gateways. In Figure 3-14, Peribit device P1 identifies two gateways that have equal cost paths to the network (N2) advertised by P2. P1 can use the two gateways on a per-destination, per-packet (round-robin), or per-flow basis.



**Figure 3-14** Configuring Router Balancing Policies

If two or more gateways (up to four) have equal cost paths to the same IP address, the routes are grouped together in the Local Routes page (Figure 3-15).

The screenshot shows the Peribit-SR web interface. The top navigation bar includes links for SETUP, REDUCTION, QOS, ACCELERATION, MONITOR, ADMIN, and HELP. The user is logged in as 'admin'. The left sidebar shows the 'Setup' menu with options like BASIC, Addresses, Interfaces, Time, License Key, SNMP, Syslog Server, Local Routes (highlighted), Registration Server, AAA, APPLICATIONS, IPSEC, and ADVANCED. The main content area is titled 'Local Routes' and shows the following information:

- OSPF: Stopped
- RIP: Stopped
- Router Polling: None
- 4 local routes are defined on this Peribit device

IP Address	Subnet Mask	Gateway	Route Type
0.0.0.0	0.0.0.0	192.168.53.130	Static
127.0.0.1	0.0.0.0	127.0.0.1	Dynamic
173.16.4.0	255.255.255.0	192.168.0.1	Dynamic
	255.255.255.0	192.168.0.2	Dynamic
192.168.53.128	255.255.255.192	192.168.53.180	Dynamic

Below the table, there is a checkbox labeled 'Static routes take precedence over dynamic routes' which is currently unchecked. At the bottom, there are buttons for 'Submit', 'Static...', 'Dynamic...', 'Import...', and 'Router Balancing...'. An arrow points to the table with the text 'Equal cost paths to the same destination'.

**Figure 3-15** Common Routes with Equal Cost Paths

To enable router balancing:

1. On the Local Routes page, click **Router Balancing**.

**Peribit-SR**

SETUP REDUCTION QOS ACCELERATION MONITOR ADMIN HELP Logged in as: admin SAVE LOGOUT

**Setup**

BASIC

- Addresses
- Interfaces
- Time
- License Key
- SNMP
- Syslog Server
- Local Routes
- Registration Server

AAA

APPLICATIONS

IPSEC

ADVANCED

**Local routes > Router balancing**

The rule selected below determines how traffic is directed when more than one gateway exists for a given subnet.

☒ **Off** All traffic is directed to one of the available routers.

☐ **Per-destination** Traffic is distributed over available routers based on destination IP address.

☐ **Per-packet** Traffic is distributed over available routers on a per-packet basis, i.e. round robin.

☐ **Flow based** Traffic is distributed over available routers based on source and destination IP addresses and ports.

Submit Reset Cancel

**Figure 3-16 Configuring Router Balancing**

2. Select one of the following router balancing policies:
  - **Off.** (Default) All traffic is directed to one of the available routers. No balancing.
  - **Per-destination.** Traffic is distributed over available routers based on destination IP address.
  - **Per-packet.** Traffic is distributed over available routers on a per-packet basis (round robin).

---

**NOTE:** Packets that lack port information, such as ICMP and fragmented packets, are sent to the first gateway, and are not balanced according to the per-packet scheme.

---

- **Flow based.** Traffic is distributed over available routers based on source and destination IP addresses and ports.
3. Click **Submit** to activate the changes, or click **Reset** to discard them.

## Configuring Registration Servers and Communities

At least one Peribit device must be designated as a registration server. The registration server stores the network information for all devices that report to it, and identifies a Peribit community for each device. Each Peribit device contacts the registration server periodically to identify the other devices in the same community, and then attempts to form a reduction tunnel to each of those devices (also called “endpoints”).

Since data reduction occurs only between devices in the same community, you can optimize performance in large deployments by limiting the number of devices in each community. To send reduced traffic between communities, you can create a hierarchical structure where selected devices reside in multiple communities (refer to [“Configuring Tunnel Switching in Hierarchical Deployments” on page 141](#)).

Initially, all Peribit devices are in the Default community. The registration server can reside in any community, and in most cases only one registration server is required. Also, you can enable or disable data reduction between any two devices in the same community, as described in [“Configuring Endpoints for Reduction Tunnels” on page 123](#).

The following sections describe how to configure registration servers and communities:

- [“Defining Registration Servers and Passwords” in the next section](#)
- [“Defining Communities” on page 78](#)

### Defining Registration Servers and Passwords

When you log in to a registration server, you can change the password of the registration server, assign devices to communities, or designate a different Peribit device as the registration server. You can also specify a secondary registration server to act as a backup if the primary server is unavailable. On all other Peribit devices, you can change only the registration server used by the device.

To configure registration server settings:

1. Log in to the device that acts as the registration server. For any other device, you can specify only the IP address and password of the registration server used by that device.
2. Click **Setup** in the menu frame, and then click **Registration Server** in the left-hand navigation frame.

**Figure 3-17** Configuring Registration Server Settings

3. To change the password of the registration server, select **Change registration server password**, and then enter the old and new passwords in the appropriate fields.

---

**NOTE:** Changing the password disrupts communication with all Peribit devices that use the registration server. To restore communication with the registration server, you must update the registration server password on each Peribit device. If you have the Peribit Central Management System (CMS), you can schedule an update for all devices.

---

4. To designate a secondary registration server that acts as a backup should the primary fail, select **Change SECONDARY registration server**, select **Use IP address**, and then enter the IP address of the Peribit device. To remove a secondary registration server, select **No secondary registration server**.

Ideally, the primary and secondary registration servers should be located on a link with relatively high bandwidth and low congestion to facilitate communication between the two servers and the other Peribit devices.

5. To designate a different device as the registration server, select **Transfer registration server designation to another device**, and then enter the IP address of the Peribit device. All devices that used the old registration server are updated with the new address (same password).

If the primary registration server fails, you can promote the secondary server to be the primary registration server, as follows:

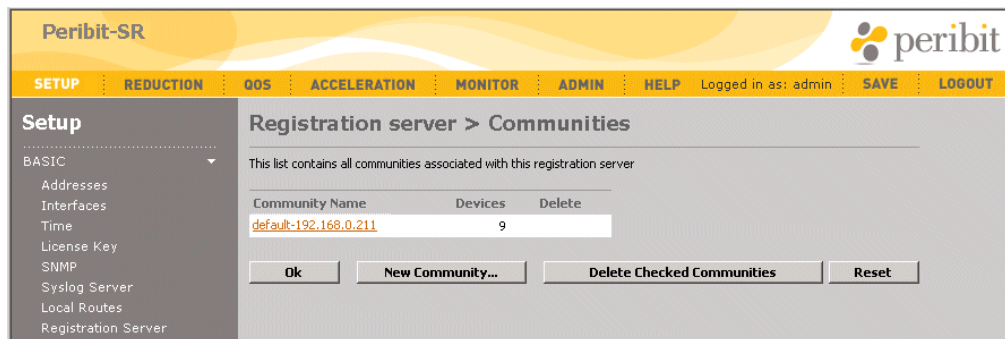
- a. Log in to the secondary registration server.
  - b. Click **Registration Server** and enter the IP address of the secondary server in the **Registration server** field.
6. To retain your changes when the device is restarted, click **SAVE** in the menu frame. If you transfer the registration server to another device, the change is saved automatically.

## Defining Communities

Data reduction occurs only between Peribit devices in the same community, so you can optimize performance by limiting the number of devices in each community. To send reduced traffic between communities, you can create hierarchical communities (refer to [“Configuring Tunnel Switching in Hierarchical Deployments”](#) on page 141).

To configure the Peribit communities on a registration server:

1. Log in to the device that acts as the registration server.
2. Click **Setup** in the menu frame, click **Registration Server** in the left-hand navigation frame, and then **Communities**.



**Figure 3-18 Viewing the Communities for a Registration Server**

On the Registration server > Communities page you can:

- Add a community. Click **New Community**, enter a community name (up to 31 characters), and click **Submit**.
  - Delete a community. Click the check box next to the appropriate names and click **Delete Checked Communities**. The devices in a deleted community are moved to the Default community if they do not belong to any other user-defined communities.
3. To define the devices in a community, click the community name.



**Figure 3-19 Viewing a List of Devices in a Peribit Community**

The Registration server > Community Devices page lists all of the Peribit devices for the community selected at the top of the page. Note the following:

- The **Reduction** and **Assembly** columns indicate whether the reduction and assembly engines are activated. To activate or deactivate the reduction and assembly engines, refer to [“Configuring Endpoints for Reduction Tunnels” on page 123](#).
- The **Duties** column can contain the following icons:

**Table 3-1 Duties Column Icon Description**

Duty icon	Description
	<b>Hub</b> —The device is designated as a Hub. Each device attempts to form a reduction tunnel with a hub before creating tunnels to other Peribit devices (refer to <a href="#">“Setting Community Topology Parameters” on page 97</a> ).
	<b>Spoke</b> — The device is designated as a spoke in a Hub and Spoke topology. By default, a spoke reduces and assembles data only for the hub device(s).
	<b>Mesh</b> — The device is designated as part of a mesh topology.
	<b>Registration Server</b> — Indicates that this device is the Registration Server for the Peribit community.
	<b>Secondary Registration Server</b> — Indicates that this device is the Secondary Registration Server for the Peribit community.
	<b>Backup</b> — The device is designated as backup for one or more primary devices. The icon flashes when the backup device is active. To configure a Peribit device as a backup, refer to <a href="#">“Configure Backup Command” on page 268</a> .

- The **Last registration** column displays the date and time the device last contacted the registration server for configuration and policy information.



4. From the Community Devices page, you can:
  - Add devices to a community. Click **Add New Devices**, select a community, enter the device IP addresses (one per line), and click **Submit**.
  - Copy devices from another community. Select the “copy from” community at the top of the page, click the check box next to the appropriate devices, select the “copy to” community at the bottom of the page, and click **Add Checked Devices**. The same device can belong to multiple communities.
  - Delete devices from a community. Select the community at the top of the page, click the check box next to the appropriate devices, and click **Remove Checked Devices**. Deleted devices are moved to the Default community if they do not belong to any other user-defined communities.
5. To retain your changes when the device is restarted, click **SAVE** in the menu frame.

## Configuring AAA

AAA stands for authentication, authorization, and accounting. Authentication verifies a user's identity, such as by user name and password or a challenge/response mechanism. Authorization provides access control, such as privilege level assignment and timeout enforcement. Users must be authenticated before they can be authorized. Accounting collects and sends auditing information, such as user traffic statistics and connection times.

Users can be authenticated and authorized using a local database or a remote RADIUS server. RADIUS allows the Peribit device to be integrated with existing authentication infrastructures such as Active Directory, NT Domain, LDAP Meta-Directories, and most Token Card and SmartCard servers. The RADIUS server provides the connection to the back-end authentication infrastructure, and existing user entries in the directory can be used for authentication and authorization.

A Peribit device is a standard RFC 2138-compliant RADIUS client. For RADIUS servers that require a client type to be specified, choose the option for a standard client and standard RADIUS dictionary. Two standard RADIUS authorization attributes are supported:

- **Attribute 6: Service-Type.** Indicates a user's access privileges. The valid service types are Administrative (6) and NAS-Prompt (7). Administrative (6) grants read-write access, and NAS-Prompt (7) grants read-only access.
- **Attribute 28: Idle-Timeout.** Indicates the number of consecutive seconds a user session can be idle before the connection is closed.

Multiple RADIUS servers can be configured for redundancy. You can use both the local database and RADIUS, so that some users are authenticated locally and others are authenticated through RADIUS.



The following topics describe how to define the authentication and authorization settings, RADIUS servers, and other security features:

- [“Selecting Authentication Methods” in the next section](#)
- [“Enabling Authorization Checking” on page 83](#)
- [“Defining RADIUS Servers and Server Groups” on page 84](#)
- [“Defining Local Users” on page 85](#)
- [“Securing Operator Access” on page 87](#)
- [“Securing Front Panel Access” on page 88](#)
- [“Changing the Packet Capture Password” on page 89](#)

## Selecting Authentication Methods

For each user interface—the Web, the SSH (CLI), and the console—you can specify the order in which the local database and RADIUS server groups are accessed to authenticate each user. You can also specify the number of SSH login attempts allowed before a user is locked out. By default, all users are authenticated locally.

To define RADIUS servers and server groups, refer to [“Defining RADIUS Servers and Server Groups” on page 84](#). To define user accounts locally, refer to [“Defining Local Users” on page 85](#).

To select the authentication methods for each user interface:

1. In the Setup page, click **AAA** in the left-hand navigation frame, and click **Authentication**.

**Peribit-SR**

SETUP REDUCTION QOS ACCELERATION MONITOR ADMIN HELP Logged in as: admin SAVE LOGOUT

**Setup**

BASIC

- Addresses
- Interfaces
- Time
- License Key
- SNMP
- Syslog Server
- Local Routes
- Registration Server

AAA

- Authentication**
- Authorization
- RADIUS
- Local Users
- Operator Access
- Front Panel Access
- Packet Capture Password

APPLICATIONS

- IPSEC

ADVANCED

**Authentication**

**Console**

Order	Method
1	Local
2	--Select a method--
3	--Select a method--
4	--Select a method--

**SSH**

Order	Method
1	Local
2	--Select a method--
3	--Select a method--
4	--Select a method--

Disconnect user ☒ After 3 failed attempts ☐ Never

**Web**

Order	Method
1	Local
2	--Select a method--
3	--Select a method--
4	--Select a method--

Authentication methods are evaluated in order until one responds with a 'pass' or 'fail'. When a method responds, the evaluation is considered final and no other methods are used.

There is one exception to this rule. If the first method is set to 'Local' and the second method is 'RADIUS', then if the Local method does not find a username entry in the local database, instead of issuing a 'fail', the RADIUS method will be used.

The 'Local' method cannot be followed by the 'None' method.

Submit Reset

Figure 3-20 Selecting Authentication Methods

## 2. Specify the following information:

Console	<p>Select up to four authentication methods for users logging in through a terminal connected to the console port. The options are:</p> <ul style="list-style-type: none"> <li>• <b>RADIUS: <i>group_name</i></b>. Attempts to authenticate users by accessing the RADIUS servers in the specified group. The servers are accessed in the order specified by the group. If all RADIUS servers are down or do not respond, the next method is tried.</li> <li>• <b>Local</b>. Attempts to authenticate users locally.</li> <li>• <b>None</b>. Login not required. Can be used alone or after the last RADIUS group. Cannot be used directly after <b>Local</b>.</li> </ul> <p>Each method is tried in the order specified. Authentication stops with the first success or failure. However, if <b>Local</b> is the first method, the next method is tried if the user is not defined locally.</p>
SSH	<p>Select up to four authentication methods for users logging in using the SSH protocol. Same options as the console, except that <b>None</b> is not available (authentication is required).</p> <p>Select the number of unsuccessful SSH login attempts allowed before a user is disconnected (1 to 10) or select <b>Never</b>.</p>
Web	<p>Select up to four authentication methods for users logging in through the Web. Same options as the console, except that <b>None</b> is not available (authentication is required).</p>

3. Click **Submit** to activate the changes.4. To retain your changes when the device is restarted, click **SAVE** in the menu frame.

## Enabling Authorization Checking

By default, all authenticated users have read-write access and a 30-minute idle timeout. If you create read-only user accounts or change the default idle timeout, either in RADIUS or in the local user database, you must enable authorization checking for the changes to take effect.

To enable or disable authorization checking:

1. In the Setup page, click **AAA** in the left-hand navigation frame, and then click **Authorization**.

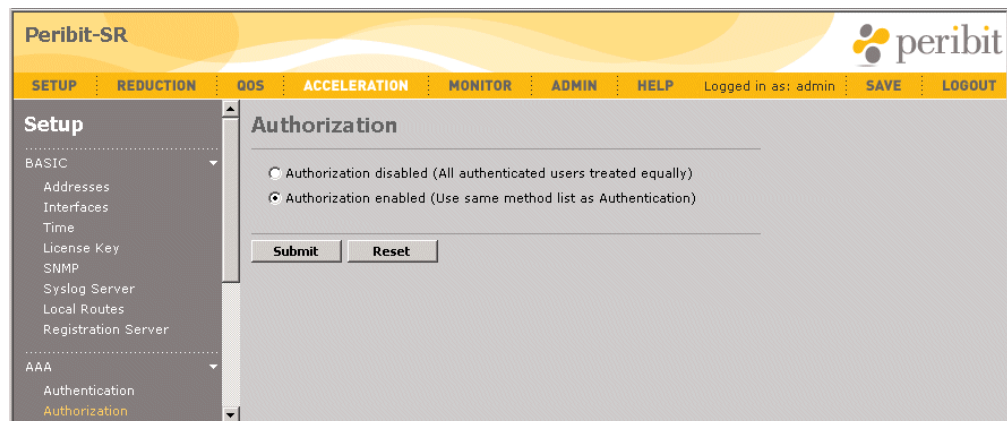


Figure 3-21 Enabling Authorization Checking

2. Select one of the following, and click **Submit**.
  - **Authorization disabled.** All users have read-write privileges and a 30-minute idle timeout.
  - **Authorization enabled.** User privilege level specified by authentication method. If RADIUS is used for authentication, but does not specify a privilege level or an idle timeout, all users have read-write privileges and a 30-minute idle timeout.
3. To retain your changes when the device is restarted, click **SAVE** in the menu frame.

## Defining RADIUS Servers and Server Groups

To use RADIUS servers to authenticate users, you must define one or more RADIUS servers and assign them to at least one server group. The servers in each group are accessed in the order specified. You can define up to four groups of five servers (the same server can appear in multiple groups).

To specify the server groups used for authentication, refer to [“Selecting Authentication Methods” on page 81](#).

To define RADIUS servers and server groups:

1. In the Setup page, click **AAA** in the left-hand navigation frame, and then click **RADIUS**.

The screenshot shows the Peribit-SR web interface. The top navigation bar includes tabs for SETUP, REDUCTION, QOS, ACCELERATION, MONITOR, ADMIN, and HELP. The left sidebar shows a tree view with 'Setup' expanded, containing 'BASIC' and 'AAA' sections. Under 'AAA', 'RADIUS' is selected. The main content area is titled 'RADIUS' and contains the following sections:

- RADIUS Client:** A text field for 'Source IP Address' with the value '192.168.0.211'.
- RADIUS Servers:** A table with columns: RADIUS Servers, IP Address, Auth. Port, Time-out (sec), Re-transmit, Dead Time (min), and Delete. It contains one entry: 'Main' with IP 10.20.30.100, Auth. Port 1812, Time-out 3, Re-transmit 3, Dead Time 0, and a delete checkbox.
- RADIUS Server Groups:** A table with columns: RADIUS Server Groups and Delete. It contains one entry: 'Central' with a delete checkbox.
- Buttons: 'New Server...', 'New Group...', 'Submit', and 'Reset'.

**Figure 3-22 Defining RADIUS Servers and Server Groups**

From the RADIUS page, you can:

- Add new servers and assign them to groups, as described in Step 2 through Step 4.
- Change a server or server group. Click the server or group name, make any needed changes, and click **Submit**.
- Change the IP address in the **Source IP Address** field (defaults to the device’s IP address). Replies from the RADIUS server are sent to the source address.

- Delete servers or groups. Select the check box next to the servers and groups you want to delete, and click **Submit**. Deleting a server group does not delete the associated servers.

2. To add a new server, click **New Server** and specify the following information:

Server Name	Enter the RADIUS server name (up to 32 characters).
IP Address	Enter the IP address of the server.
Authentication Port	Enter the UDP port number used for authentication (default is 1812).
Timeout	Enter the number of seconds (1 to 65535) that the Peribit device waits for the server to respond.
Retransmit	Enter the number of times (1 to 100) that requests are retransmitted to a server before trying the next server in the group (if any).
Dead Time	If the server fails to respond to all retransmissions, enter the number of minutes (0 to 1440) that the Peribit device waits before trying to access the server again.
Shared Secret Key	Enter the secret key (up to 31 characters) used to access the server. The same key must be configured on the RADIUS server.

3. To add a new server group, click **New Group** and specify the following information:

RADIUS Group Name	Enter the server group name (up to 32 characters).
RADIUS Servers	Select the RADIUS servers in the group (up to five). The servers are accessed in the order specified. For example, if the first server does not respond, the second server is accessed.

4. Click **Submit** to activate the changes.

5. To retain your changes when the device is restarted, click **SAVE** in the menu frame.

## Defining Local Users

You can define up to 25 users that can be authenticated locally by the Peribit device. Each user can have full (admin) or read-only access privileges. The predefined **admin** account has a default password of **peribit**. To ensure secure access to the device, you should change the password periodically. To specify how users are authenticated (locally and/or through RADIUS), refer to [“Selecting Authentication Methods” on page 81](#).

To define local user accounts:

1. In the Setup page, click **AAA** in the left-hand navigation frame, and then click **Local Users**.

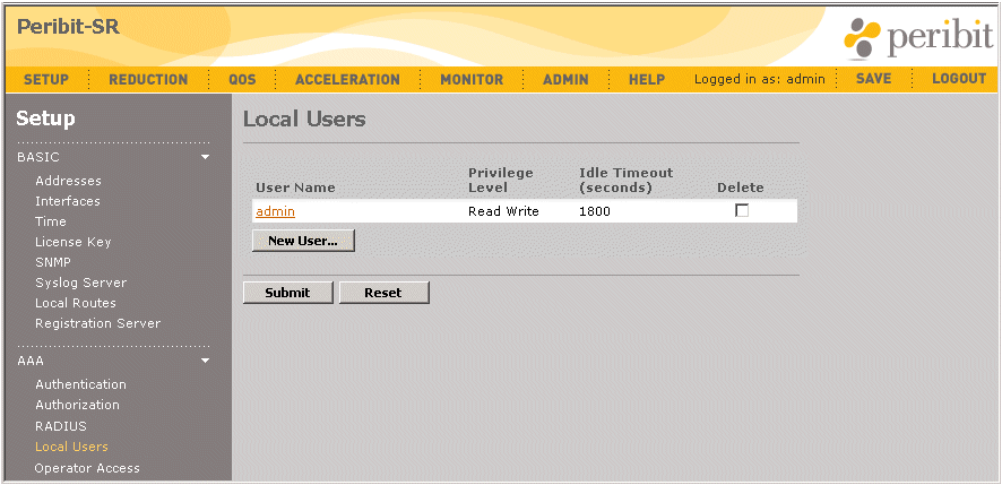


Figure 3-23 Defining Local Users

From the Local Users page, you can:

- Add a new user account, as described in Step 2 through Step 4.
- Change a user account. Click the user name, make any needed changes, and click **Submit**.
- Delete user accounts. Select the check box next to the accounts you want to delete, and click **Submit**.

2. To add a new account, click **New User** and specify the following information:

User Name	Enter the account name (up to 32 characters).
Privilege Level	Select administrator or read-only privileges.
Idle Timeout	Enter the number of minutes before an idle user is logged out (the default is 30) or select <b>Never</b> .
Password	Enter the password twice (from 4 to 64 characters).

**NOTE:** Authorization checking is disabled by default, so that all authenticated users have read-write access and a 30-minute idle timeout. If you create read-only user accounts or change the default idle timeout, you must enable authorization checking (refer to [“Enabling Authorization Checking” on page 83](#))

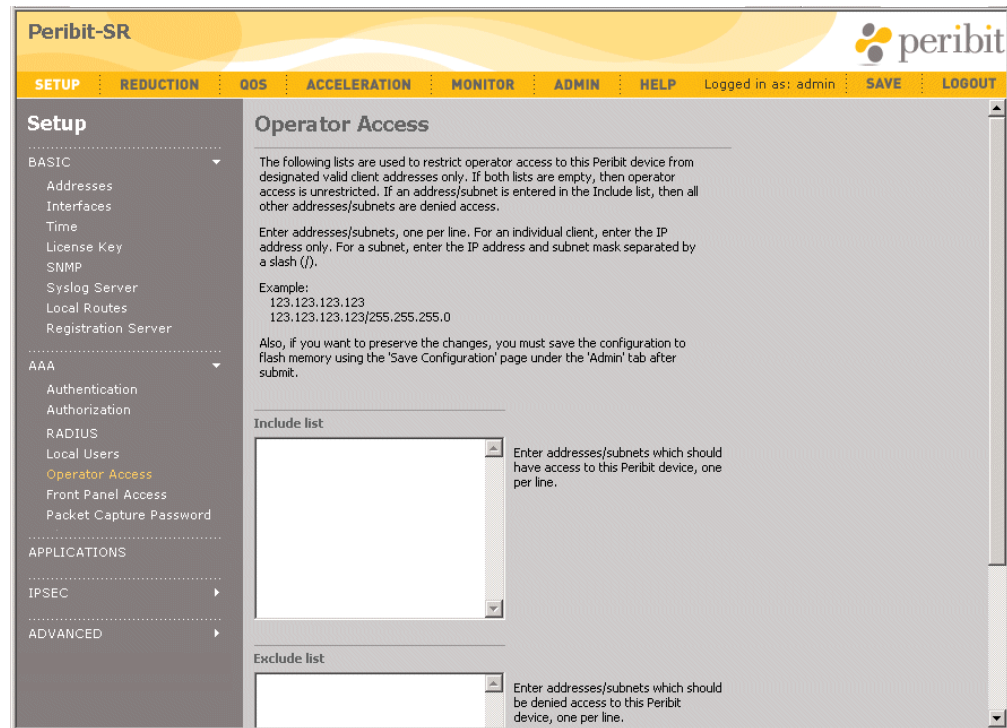
- 3. Click **Submit** to activate the changes.
- 4. To retain your changes when the device is restarted, click **SAVE** in the menu frame.

## Securing Operator Access

You can create an Include or Exclude list to allow or deny access to the Peribit device from specific IP addresses or subnets. For example, if you enter one address in the Include list, users can log in only from the specified address. Alternatively, if you enter an address or subnet in the Exclude list, access to the device from that address or subnet is denied. By default, the Include and Exclude lists are empty.

To restrict operator access:

1. In the Setup page, click **AAA** in the left-hand navigation frame, and then click **Operator Access**.



**Figure 3-24 Controlling Operator Access**

2. To allow access only from specific IP addresses or subnets, enter the addresses or subnets in the **Include list** (one per line). The subnet format is:

<IP address>/<subnet mask>

All other client IP addresses are denied access to the device.

3. To deny access only from specific IP addresses or subnets, enter the addresses or subnets in the **Exclude list** (one per line).

---

**NOTE:** IP addresses in both the Include and Exclude lists are denied access.

---

4. Click **Submit** to activate the changes, or click **Reset** to discard them.
5. To retain your changes when the device is restarted, click **SAVE** in the menu frame.

## Securing Front Panel Access

You can lock the front-panel of a Peribit device to prevent anyone from rebooting the device or making configuration changes through the front panel keypad.

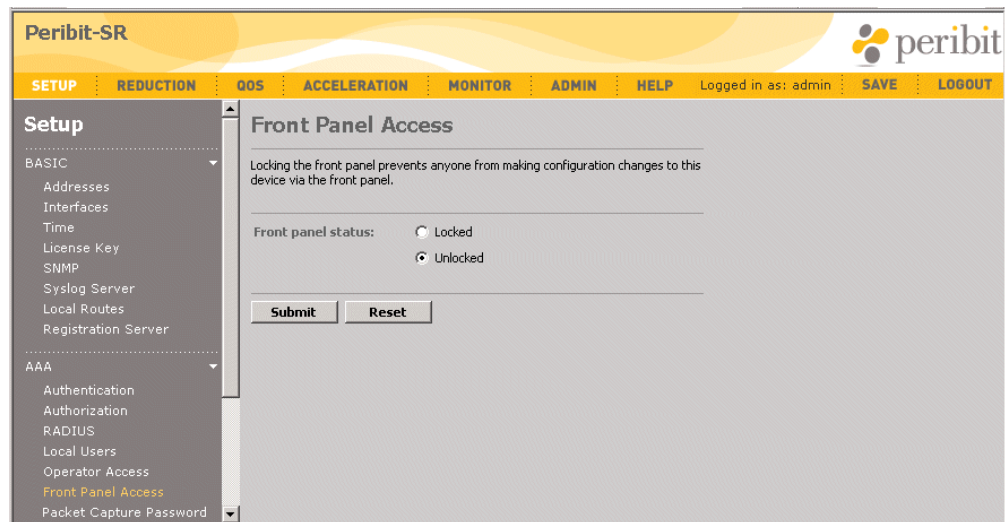
---

**NOTE:** The SR-15, SR-20, and SM-250 do not have a front-panel keypad. Also, locking the front panel on the SR-100 does not lock the front panels of the client devices.

---

To lock the front panel keypad:

1. In the Setup page, click **AAA** in the left-hand navigation frame, and then click **Front Panel Access**.



**Figure 3-25** Controlling Front Panel Access

2. To lock the front-panel keypad, select **Locked**.
3. Click **Submit** to activate the changes, or click **Reset** to discard them.
4. To retain your changes when the device is restarted, click **SAVE** in the menu frame.



## Changing the Packet Capture Password

The default packet capture password for the Web console and CLI is **peribit**. To ensure secure access to the packet capture feature, you should change the password periodically.

To change the packet capture password:

1. In the Setup page, click **AAA** in the left-hand navigation frame, and then click **Packet Capture Password**.

The screenshot shows the Peribit-SR web console interface. The top navigation bar includes links for SETUP, REDUCTION, QOS, ACCELERATION, MONITOR, ADMIN, and HELP. The user is logged in as 'admin'. The left-hand navigation menu is expanded to the 'AAA' section, which includes Authentication, Authorization, RADIUS, Local Users, Operator Access, Front Panel Access, and Packet Capture Password. The main content area is titled 'Packet Capture Password' and contains a text box explaining that the password is required to start a packet capture or copy it to a local disk. Below this, there are three input fields labeled 'Old password:', 'New password:', and 'Verify new password:'. A 'Submit' button is located at the bottom of the form.

**Figure 3-26 Changing the Packet Capture Password**

2. In the Packet Capture Password page, type the current password, and then type the new password in the **New password** and **Verify new password** fields.
3. Click **Submit** to activate the changes.
4. To retain your changes when the device is restarted, click **SAVE** in the menu frame.



## Managing Applications

Application definitions allow the Peribit device to identify the traffic of up to 256 applications (the SR-15 is limited to 100). Definitions are provided for applications with well-known port numbers. All other applications are grouped together as “Undefined” or “Others”. For each additional application you define, you can:

- Enable or disable data reduction, as described in [“Reducing and Monitoring Applications” on page 130](#). To conserve system capacity, you should disable reduction for applications whose traffic is encrypted or already compressed.
- Enable Packet Flow Acceleration (if data reduction is enabled), as described in [“Configuring Packet Flow Acceleration” on page 177](#).
- Assign the application to a traffic class to manage its outbound bandwidth allocation, as described in [“Configuring Outbound QoS Policies” on page 153](#).
- View reduction and acceleration statistics for the application, as described in [“Viewing Results” on page 201](#).

Each application definition can have up to five rules, and each rule can specify a protocol, source and destination port numbers (or range of port numbers), source and destination IP addresses or subnets, a ToS/DSCP value, and a URL or a Citrix client and application name.

A packet matches an application definition if a match occurs on any of its rules. All the values defined in the same rule must be true for a match to occur on that rule. A packet is classified under the first application for which a rule match is found. Packets are compared against the definitions according to the precedence value (definitions with the lowest precedence values are checked first). The comparison stops on the first match, so if two definitions are similar, the more specific definition must have a lower precedence value.

Table 3-2 list the default application definitions. Each definition has rules to match any traffic that has the specified port number(s) as the source or destination.

**Table 3-2 Default Application Definitions**

Application	Precedence	Port Numbers
AOL	36	5190-5193
CIFS	6	445
Clearcase	23	371
CVS	33	2401
DNS	15	53
Exchange	20	135
		<b>Note:</b> Port 135 is the startup port; other ports are learned dynamically. This definition applies only to Exchange traffic for Windows clients, not Web clients.
Filenet	40	32768-32774
FTP	1	20-21
		<b>Note:</b> Non-default FTP ports are learned dynamically.
Groupwise	29	1677
Hostname Resolution	21	42

**Table 3-2 Default Application Definitions**

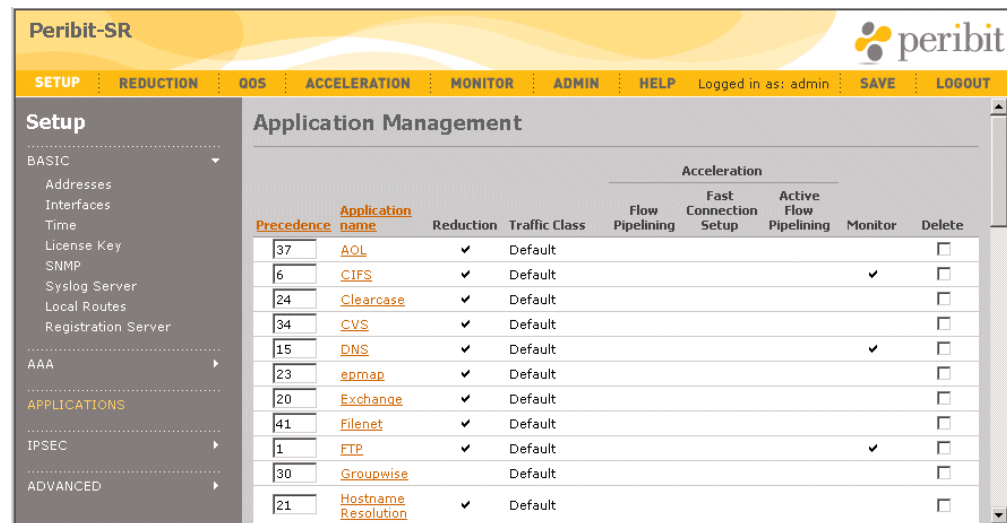
<b>Application</b>	<b>Precedence</b>	<b>Port Numbers</b>
HTTP	4	80, 8080
HTTPS	12	443
ICA	9	1494
Kerberos	17	88
LDAP	16	389
Lotus Notes	7	1352
Mail	3	25,110,143
MS Streaming	30	1755
MS Terminal Services	18	3389
NetBios	5	137-139
NFS	32	2409
Novell NCP	27	524
Oracle	11	1525
PCAnywhere	37	5631-5632
Printer	26	515
RADIUS	31	1812, 1813
RTSP	28	554
SAP	35	3300-3388,3390-3399,3600-3699,3200
Shell	24	514 TCP
SNMP	19	161-162
SNTP	14	123
SQL Server	8	1433
SSH	13	22
Sybase	10	1498
Symantec Anti-Virus	34	2967
Syslog	25	514 UDP
TACACS	22	49
Telnet	2	23
Traceroute	41	33434-33534 UDP
XWindows	38	6000-6063

## Configuring Application Definitions

**NOTE:** To add an application definition by selecting an undefined application from the Top Traffic report, refer to [“Viewing and Exporting Top Traffic Statistics”](#) on page 222.

To add or change application definitions:

1. In the Setup page, click **APPLICATIONS** in the left-hand navigation frame.



**Figure 3-27 Application Management Page**

From the Application Management page, you can:

- Add a new application definition, as described in Step 2 through Step 6.
- Change an application definition. Click the application name, make any needed changes, and click **Submit**.
- Change an application definition’s precedence. Type a new value in the precedence field and click anywhere in a blank area of the page to renumber the definitions. The new value cannot exceed the highest value in the current range. Lower values indicate a higher precedence.
- View all the current application definitions on one page by clicking **Definitions**.
- Delete application definitions. Select the check box next to the applications you want to delete, and click **Submit**.

2. To add a new application definition, click **New Application**.

The screenshot shows the peribit web interface for SR-192.168.73.11. The top navigation bar includes links for SETUP, REDUCTION, QOS, ACCELERATION, MONITOR, ADMIN, and HELP. The user is logged in as 'admin' and can click 'SAVE' or 'LOGOUT'. The left sidebar shows a tree view with 'Setup' expanded, containing 'BASIC' (Addresses, Interfaces, Time, License Key, SNMP, Syslog Server, Local Routes, Registration Server), 'AAA', 'APPLICATIONS', 'IPSEC', and 'ADVANCED'. The main content area is titled 'Application definition > New'. It features a text input for 'Application name'. Below this, a table defines rules for application traffic identification. The table has columns for Source Address, Source Port, Destination Address, Destination Port, Protocol, and Advanced. There are five rows, each with a 'CLEAR' button. Below the table, there are instructions: 'Enter IP Address or subnet. Examples: 123.123.123.123 or 123.123.123.0/255.255.255.0' and 'Use commas to enter multiple ports. Use hyphen (-) to specify a range. Example: 25, 27, 125-135'. At the bottom are 'Submit' and 'Cancel' buttons.

Figure 3-28 Defining New Applications

3. Specify the following information:

Application name      Enter a name for the application (up to 63 characters).

Specify up to five rules composed of one or more of the following values. A match occurs if any of the rules are true. All values defined in the same rule must be true for a match to occur on that rule. You can specify a total of 512 rules for all applications.

- Source Address      Enter a source IP address or subnet. The general format is:  
address/subnetmask  
A blank or an asterisk (\*) with no subnet mask indicates any source IP address.
- Source Port      Enter a source port number, a series of comma-separated port numbers, or a range of port numbers separated by a hyphen (-). A blank indicates any port. For a list of common application port numbers, refer to [Appendix E, “Common Application Port Numbers”](#).
- Destination Address      Enter a destination IP address or subnet (same format as the source address). A blank or asterisk (\*) indicates any destination IP address. Typically, source and destination addresses are specified in separate rules so that a match occurs on either one. A rule that specifies source and destination addresses will match only the traffic between those addresses.
- Destination Port      Enter one or more destination port numbers (same format as the source port). A blank indicates any port. Typically, source and destination ports are specified in separate rules so that a match occurs on either one. A rule that specifies source and destination ports will match only the traffic between those ports.
- Protocol      Select an application protocol or select **Any** to indicate TCP or UDP. You can also type in a protocol number (0 to 134). By default, a match can occur on any TCP or UDP packet.
- NOTE:** Any protocol defined by number is added to the **Any** list of defaults that applies to each rule that does not specify a protocol. To use application pattern matching (described below), select **TCP**.

4. To include a Type of Service (ToS) value, URL, or Citrix name in a rule, click **Advanced** next to the rule and specify the following:

ToS Bits	<p>Select the check box, and then select one of the following:</p> <ul style="list-style-type: none"> <li>• <b>IP Precedence.</b> Select an IP precedence value (0 through 7).</li> <li>• <b>DSCP.</b> Enter a DSCP value (0 through 63).</li> </ul> <p>For more information about ToS and DSCP, refer to <a href="#">“Changing Out-bound ToS/DSCP Values” on page 170</a>.</p>
Application pattern matching	<p>Select the check box, and then specify the following:</p> <ul style="list-style-type: none"> <li>• <b>Application.</b> Select an application (<b>HTTP</b> or <b>Citrix</b>).</li> <li>• <b>Search string.</b> Enter a URL or a Citrix client and/or application name.</li> </ul> <p>A URL can be up to 127 characters. The general format is:</p> <p>&lt;host&gt;/&lt;uri&gt;</p> <p>Where:</p> <p><b>&lt;host&gt;</b> is up to eight strings separated by periods. You can use an asterisk (*) by itself to indicate any string. For example:</p> <p>www.peribit.*.com/</p> <p>The slash is required even when only the host is specified. Consecutive periods, such as "..." are interpreted as ".*.*.*", and will match any host name.</p> <p><b>&lt;uri&gt;</b> is up to eight strings separated by slashes. You can use an asterisk (*) by itself to indicate any string. For example:</p> <p>www.peribit.*.com/*/index.htm</p> <p>Note that an asterisk is treated as a single character (not a wildcard) when it is part of a string, such as “www.peribit*.com”.</p>

Click **Continue** to return to the Application Definition page.

5. Click **Submit** to activate the definition, or click **Cancel** to discard it. To erase an entire rule, including the advanced settings, click **CLEAR**.
6. To retain your changes when the device is restarted, click **SAVE** in the menu frame.

## Testing New Application Definitions

A new definition is assigned the next highest precedence value (lowest precedence), and data reduction and monitoring begin automatically. If you do not see any traffic for the application (refer to [“Viewing Results” on page 201](#)), check the accuracy of the definition, and verify that the traffic is not being counted against an application with a more general definition and a higher precedence (lower precedence value).

If the new application is encrypted or already compressed, you should disable data reduction, as described in [“Reducing and Monitoring Applications” on page 130](#).

If you are using Packet Flow Acceleration (PFA), verify that the new application is enabled or disabled (as appropriate) for each acceleration method, as described in [“Configuring Packet Flow Acceleration” on page 177](#).









## Chapter 4 Configuring Advanced Setup Policies

---

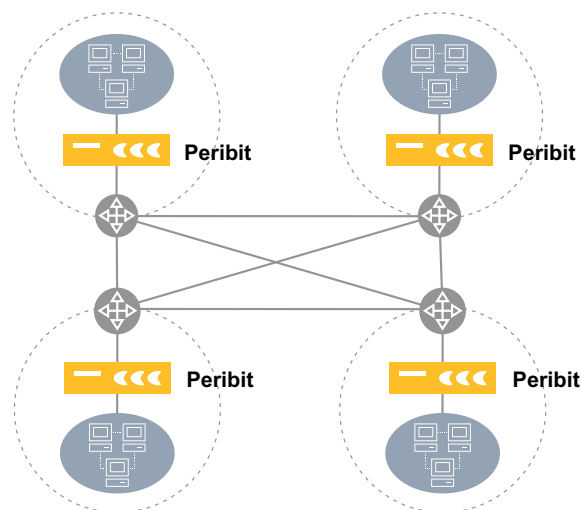
The following topics describe the advanced setup procedures:

- [“Setting Community Topology Parameters” in the next section.](#)
- [“Filtering Data Reduction by Source and Destination” on page 100](#)
- [“Configuring the ARP Table” on page 102](#)
- [“Defining the Prime Time” on page 103](#)
- [“Configuring Packet Interception” on page 104](#)
- [“Configuring Policy-Based Multi-Path” on page 113](#)

### Setting Community Topology Parameters

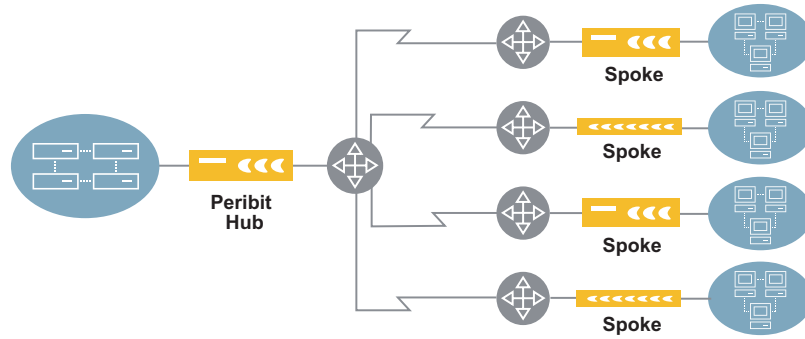
When you create a Peribit community of devices, you can select the community topology setting that best describes your network. The community topology setting ensures that resources are used efficiently to reduce and assemble data between devices. The topology setting can be Mesh or Hub and Spoke.

In a Mesh topology, multiple devices are interconnected and each one can reduce and assemble data for all the others.



**Figure 4-1 Mesh Topology**

In a Hub and Spoke topology, a central device (hub) can reduce and assemble data for all other devices in the Peribit community. By default, the spoke devices reduce data only for the hub. However, this setting can be changed, as described in [“Configuring Endpoints for Reduction Tunnels” on page 123.](#)



**Figure 4-2 Hub and Spoke Topology**

For Hub and Mesh topology settings, you must specify the range of Peribit devices in the community. The following table shows the numbered ranges of devices supported by each type of Peribit device. The **max-mem** option allocates all available memory for up to 20 reduction tunnels (all devices must be the same model and have the same topology setting).

**Table 4-1 Device Ranges by Model and Topology**

Device Type	Mesh	Hub
SM-500	0=1-15	0=1-15
	1=16-20	1=16-20
	2=21-25	2=21-25
	3=26-30	3=26-30
	4=31-35	4=31-40
	5=36-40	5=41-60
	max-mem=1-5	max-mem=1-5
SM-250	0=1-5	0=1-5
	1=6-10	1=6-10
	2=11-15	2=11-15
SR-15, SR-20	0=1-5	0=1-5
SR-50	0=1-20	0=1-20
SR-55	1=21-35	1=21-40
	2=36-50	2=41-60
	3=51-60	3=61-80
	4=61-70	4=81-100
	5=71-80	5=101-120
	max-mem=1-5	max-mem=1-5
SR-80	0=1-60	0=1-60
SR-100	1=61-100	1=61-110
	2=101-140	2=111-160
	3=141-170	3=161-210
	4=171-195	4=211-260
	5=196-220	5=261-320
	max-mem=1-20	max-mem=1-20
SR-100 with clients	The total range is the sum of the ranges for each device. If you select range 4 for an SR-100 hub with two SR-50 clients, the top value is 460 (260 + 100 +100).	

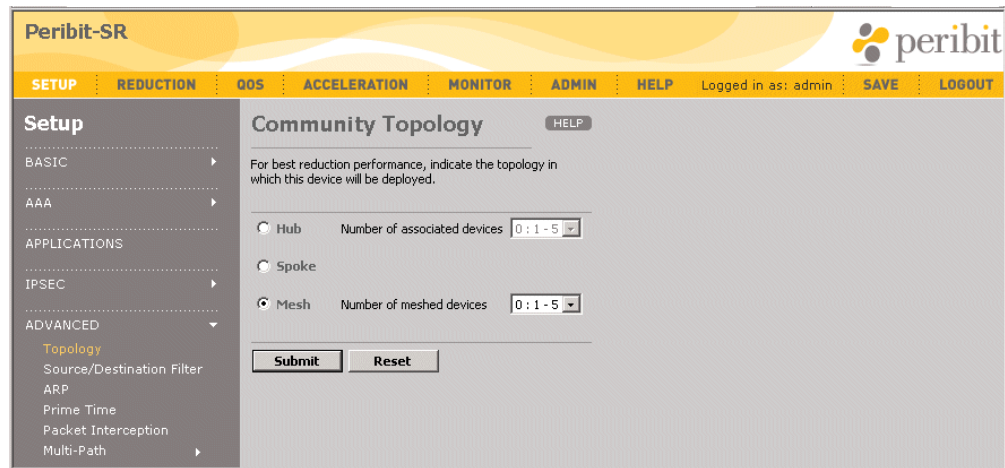
---

**NOTE:** On devices other than the SM-500, when the maximum range of devices is selected for a hub (range 5), the hub conserves memory by not assembling data from the spokes—only data sent from the hub to the spokes is reduced. In this case, tunnel switching cannot be enabled on the hub (refer to [“Configuring Tunnel Switching in Hierarchical Deployments” on page 141](#)).

---

To review or change the community topology setting:

1. In the Setup page, click **ADVANCED** in the left-hand navigation frame, and then click **Topology**.



**Figure 4-3** Reviewing and Changing the Community Topology Settings

2. On the Community Topology page, select one of the following topology settings:

Hub	In a Hub and Spoke topology, a hub reduces and assembles data for all devices in the Peribit community. Select the range of devices in the community. If a community has multiple hubs, each hub must specify the same range of devices.  Note that a registration server does not have to be a hub.
Spoke	By default, a spoke reduces and assembles data only for devices that are designated as hubs. To change this default setting, refer to <a href="#">“Configuring Endpoints for Reduction Tunnels” on page 123</a> .
Mesh	In a Mesh topology, each device reduces and assembles data for all other devices in the Peribit community. Select the range of devices in the community.

---

**NOTE:** Selecting an accurate device range allows each device to allocate its resources efficiently. Mixing hub and spoke with mesh designations in the same community is not recommended.

---

3. Click **Submit** to activate the changes, or click **Reset** to discard them.
4. To retain your changes when the device is restarted, click **SAVE** in the menu frame.

## Filtering Data Reduction by Source and Destination

You can enable or disable data reduction between specific sources and destinations by creating a list of source and destination addresses or subnet pairs that are either included or excluded from data reduction. This source/destination filter applies to all application traffic sent from the LAN to the WAN. To enable or disable data reduction by application, refer to [“Reducing and Monitoring Applications” on page 130](#). The source/destination filter is applied before the application filter, and is more efficient.

**NOTE:** If you disable data reduction between a source and destination, Packet Flow Acceleration between those points is also disabled.

For example, to disable data reduction for all traffic from a local subnet, create a “Do not reduce” entry and specify the subnet as the source and enter an asterisk (\*) as the destination. To disable data reduction for all traffic sent to the subnet from other Peribit devices, you must disable the advertisement of the subnet (refer to [“Advertising Reduction Subnets” on page 126](#)).

To define source and destination subnets:

1. In the Setup page, click **ADVANCED** in the left-hand navigation frame, and then click **Source/Destination Filter**.

**Peribit-SR**

SETUP REDUCTION QOS ACCELERATION MONITOR ADMIN HELP Logged in as: admin SAVE LOGOUT

**Setup**

- BASIC
- AAA
- APPLICATIONS
- IPSEC
- ADVANCED
  - Topology
  - Source/Destination Filter**
  - ARP
  - Prime Time
  - Packet Interception
  - Multi-Path

**Source/Destination Filter**

☒ Off (default)  
☐ Reduce data between the following source/destination pairs ONLY  
☐ DO NOT reduce data between the following source/destination pairs

Source	Destination	Bidirectional
No Source and Destination subnets defined		

Source	Destination	Bidirectional
<input type="text"/>	<input type="text"/>	<input type="checkbox"/>

Click on "Submit" button to add a new source/destination pair. Enter IP address or address/subnet. Enter asterisk (\*) to indicate that source or destination can be ANY address. Examples: 123.123.123.123 or 123.123.123.0/255.255.255.0

Submit Reset

**Figure 4-4 Filtering Data Reduction by Source and Destination**

2. Select the type of source/destination filter you want to create.
  - **Off (default).** Data is reduced for all eligible application traffic from all local routes to all remote routes advertised by the other Peribit devices.
  - **Reduce data between the following source/destination pairs ONLY.** Data is reduced only for the specified source and destination pairs.
  - **DO NOT reduce data between the following source/destination pairs.** All data is reduced, except for the specified source and destination pairs.

3. Specify the following information:

Source	Enter a source IP address or subnet. The general format is: address/subnetmask  The default subnet mask is “255.255.255.255”. An asterisk (*) with no subnet mask indicates any source IP address.
Destination	Enter a destination IP address or subnet (same format as the source address). An asterisk (*) indicates any destination IP address.
Bidirectional	Select the check box to include traffic sent from the destination to the source. This option is particularly useful for creating “do not reduce” lists in Peribit Profile Mode.  In Profile Mode, you should exclude all traffic sent to the subnet where the Peribit device is installed. For more information about Profile Mode, refer to <a href="#">“Peribit Profile Mode” on page 359</a> .

4. Click **Submit** to activate the changes. To restore the original parameters, click **Reset**.

5. To retain your changes when the device is restarted, click **SAVE** in the menu frame.

## Configuring the ARP Table

The Address Resolution Protocol (ARP) is used to:

- Determine whether the gateway for a route is on the Local or Remote interface
- Discover the hardware (MAC) addresses of devices that are directly addressable on the Local and Remote interfaces

For devices that do not respond to ARP requests, you can add static ARP entries that map their IP addresses to their MAC addresses. You can also clear the dynamic ARP entries if you suspect some entries are out of date.

To configure the ARP table:

1. In the Setup page, click **ADVANCED** in the left-hand navigation frame, and then click **ARP**.

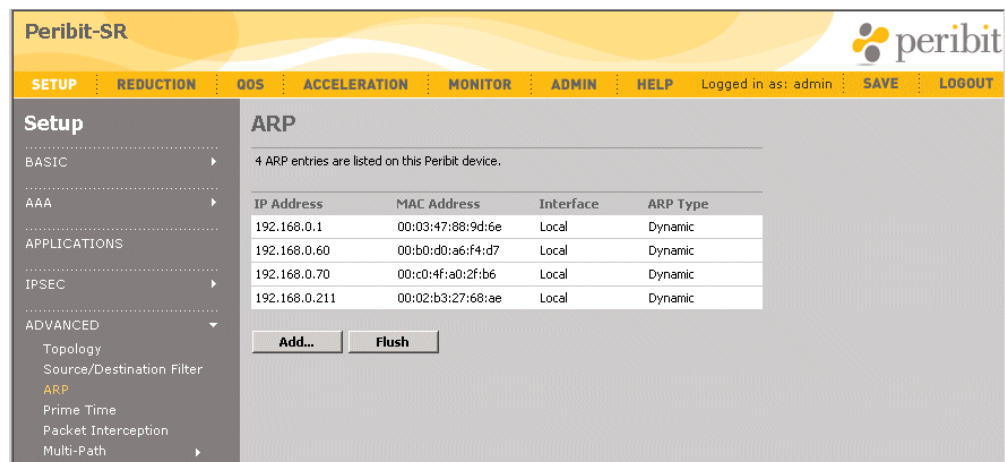


Figure 4-5 Viewing the ARP Table

2. To delete all dynamic ARP entries, click **Flush**. This forces new ARP requests to be issued as needed.
3. To delete a static ARP entry, click **DELETE** next to the entry.
4. To add one or more static ARP entries, click **Add**, enter the IP address and its associated MAC address, and select the **Local** or **Remote** interface. You can add up to five entries at one time.

Click **Submit** to activate the new entries, or click **Cancel** to discard them.

5. To retain your changes when the device is restarted, click **SAVE** in the menu frame.

## Defining the Prime Time

The prime time setting lets you specify the days of the week and hours of the day when network performance is most important. The prime time can be used to filter performance statistics, and to specify bandwidth management policies for prime-time and non prime-time hours. For example, to view reduction and acceleration statistics during business hours, you can set the prime time to 9:00 AM to 5:00 PM on Monday through Friday.

Prime time is disabled by default, which means the effective “prime time” is 24-hours a day, seven days a week.

To define the prime time:

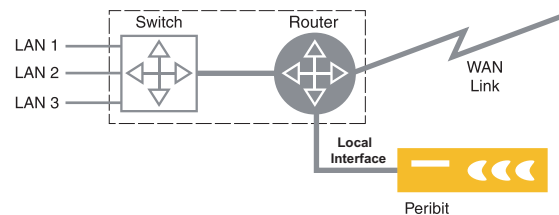
1. In the Setup page, click **ADVANCED** in the left-hand navigation frame, and then click **Prime Time**.

**Figure 4-6 Defining the Prime Time**

2. To set the prime time, select the **Use Prime Time** check box, select a time range, and select the days of the week.
3. Click **Submit** to activate the changes, or click **Reset** to discard them.
4. To retain your changes when the device is restarted, click **SAVE** in the menu frame.

## Configuring Packet Interception

Peribit devices are usually deployed in the data path between a LAN switch and a WAN edge router. When interrupting the data path is not practical, such as in collapsed backbone environments, you can deploy Peribit devices “off path” (Figure 4-7). In an off-path deployment, the Local interface is connected to the switch or the router, and the Remote interface is not used (connecting the Local interface directly to the router is recommended).



**Figure 4-7 Off-Path Deployment**

The following topics describe how to configure packet interception on a Peribit device and on the local switch or router. A few alternatives to packet interception are also described.

- [“Configuring Packet Interception for Off-Path Peribit Devices” in the next section](#)
- [“RIP Router/Switch Configuration Commands” on page 107](#)
- [“WCCP Router Configuration Commands” on page 109](#)
- [“External Policy-Based Router Commands” on page 110](#)
- [“Alternatives to Packet Interception” on page 111](#)

### Configuring Packet Interception for Off-Path Peribit Devices

In an off-path deployment, the traffic to be reduced must be routed to the Peribit device using packet interception. Both the router and the Peribit device must be configured using one of the following methods of packet interception:

- **Route injection.** The Routing Information Protocol (RIPv2) is used to advertise the off-path device as the lowest cost “router” for all the reduction subnets advertised by the other Peribit devices in the community. Note the following:
  - If a remote Peribit device advertises its own subnet for reduction, the off-path device generates several new subnets to exclude (carve out) the IP address of the remote device. This prevents the router from returning the traffic sent to the remote device.
  - The off-path device has no passthrough data. Both reduced and unreduced traffic is sent through the reduction tunnel.

To configure a router to use RIP routes, refer to the sample router commands in [“RIP Router/Switch Configuration Commands” on page 107](#).

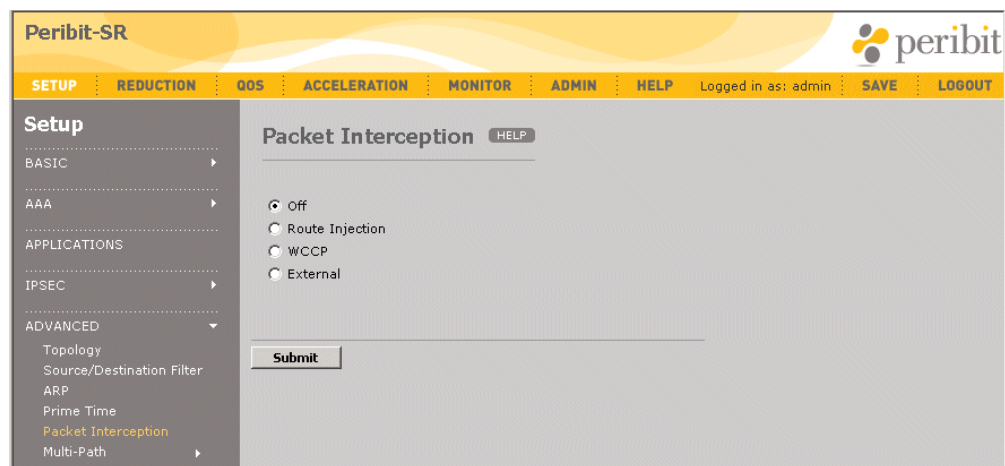
- **WCCP.** The Web Cache Communication Protocol is used to redirect traffic by protocol from the router to the off-path device. The router must support WCCP version 2. To configure a router to use WCCP, refer to the sample router commands in [“WCCP Router Configuration Commands” on page 109](#).

- **External.** The WAN edge router is configured to route traffic to the off-path device. The off-path device should be connected directly to the router, and must be the only device on the port. You can also connect the off-path device to a dedicated VLAN on a Layer 3 switch. Refer to the sample router commands in [“External Policy-Based Router Commands” on page 110](#).

In each case, the redirected traffic is reduced (if eligible) and returned to the router or switch over the Local interface. Note that for off-path deployments, inbound QoS is not supported, and outbound QoS is limited to the WAN traffic that is routed through the Peribit device. Also, off-path devices do not support multi-node configurations, but an SR-100 with up to six client devices can be installed off path.

To configure packet interception for an off-path Peribit device:

1. In the Setup page, click **ADVANCED** in the left-hand navigation frame, and then click **Packet Interception**.



**Figure 4-8** Configuring Packet Interception

2. Select one of the following methods of packet interception:

---

**CAUTION:**Enabling packet interception disables the Remote interface. If the Peribit device is installed in the data path, all data transmission through the device will stop.

---

- To use RIPv2 for packet interception, click **Route Injection**, and specify the following:

Authentication Type	If the WAN edge router uses RIP authentication, click <b>Password</b> and enter the RIP password. This is the same password used to discover dynamic routes (refer to <a href="#">“Enabling RIP and OSPF Support” on page 70</a> ).
Inter-packet delay	To reduce the load on slower routers, enter the number of milliseconds between each packet when multiple packets are generated for a single RIP update (0 through 50). The default is 0.

You can lower the RIP update timers to reduce the failover time (not recommended if RIP is used for network-wide routing). To change the frequency of RIP updates or the cost assigned to each advertised route, refer to [“Configure Packet Interception Command” on page 282](#).



- To use WCCP for packet interception, click **WCCP**, and specify the following:

Router IP Address	Enter the IP address of the WAN edge router (the router must support WCCP version 2).
WCCP Priority	Enter a number (0 through 255) that indicates the order in which packets are compared against the selected services (protocols), relative to the other services redirected by the router. Higher values have a higher priority. The default is 230.  For example, if the router is redirecting HTTP traffic to a Web cache using priority 240, and you want to redirect all TCP traffic to the off-path device, specify a lower value to avoid “stealing” traffic from the Web cache.
WCCP Auth. Password	If the WAN edge router uses WCCP authentication, enter the WCCP password specified on the router.

Specify the following for each service (up to five):

IP Protocol	Select a protocol whose traffic you want redirected to the off-path device. You can also type in a protocol number (0 through 255). The standard protocol numbers are defined at:  <i><a href="http://www.iana.org/assignments/protocol-numbers">http://www.iana.org/assignments/protocol-numbers</a></i>
WCCP Service ID	Enter a service ID number for the protocol (51 through 99). The ID must be unique among all the WCCP services defined on the router. <b>In high-availability environments, where two Peribit devices use the same router, they must use different IDs for the same protocol.</b>  Heartbeat packets are sent to the router every 10 seconds for each service. If the Peribit device fails, the router stops redirecting traffic in 30 seconds.

- To configure packet interception by defining routing policies on the router, click **External**. Refer to the sample router commands in “[External Policy-Based Router Commands](#)” on page 110.

3. Click **Submit** to activate the changes.

4. Review the reduction subnets and be sure to advertise only the subnets on the LAN side of the off-path device (refer to “[Advertising Reduction Subnets](#)” on page 126). Since only the Local interface is connected to the network, the device cannot distinguish between LAN- and WAN-side subnets.

---

**CAUTION:** If you use RIP for packet interception, and you have multiple remote Peribit devices installed on the same subnet, you must disable advertisement of the local subnet on all (or all but one) of the remote devices. Otherwise, the off-path device cannot carve out the remote device addresses, and all traffic sent to them is returned by the router.

---

5. To retain your changes when the device is restarted, click **SAVE** in the menu frame.

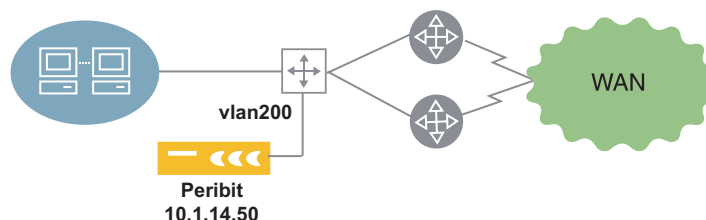
The following sections provide sample router configuration commands to support each method of packet interception.

## RIP Router/Switch Configuration Commands

In general, an off-path Peribit device should be connected to a dedicated port on a router or Layer 3 switch. RIP is then configured on the router or switch where the Peribit device is connected. If the off-path device is connected to a Layer 2 switch, RIP is configured on the router. In each case, the RIP configuration is essentially the same.

### Single Layer 3 Switch

The following commands provide an example of how to configure RIP on a Layer 3 Cisco switch (Figure 4-9). Installing the Peribit device on a dedicated VLAN is recommended to reduce the routing failover time if the Peribit device fails. The port where the Peribit device is connected should be the only port in the VLAN. Note that the load balancing done by the switch across the two routers is not affected.



**Figure 4-9 Off-Path Peribit Device Connected to a Layer 3 Switch**

1. Enable RIP version 2:

```
router rip
version 2
```

2. If RIP is used only for packet interception, you can lower the RIP timers to reduce the failover time (may cause instability if RIP is used for network-wide routing):

```
timers basic 5 15 15 30
```

3. Enable RIP to listen passively on all interfaces:

```
passive-interface default
```

4. Specify the subnet where the off-path device is installed:

```
network 10.1.0.0
```

5. Specify the RIP administrative distance to be lower than all other methods used by the router or switch to discover routes (such as OSPF):

```
distance 30
```

6. Disable auto-summarization of routes:

```
no auto-summary
```

Do not redistribute the RIP routes to any other routing protocol, such as OSPF. The advertised RIP routes apply only to the configured router or switch and the off-path Peribit device. If RIP is used only for packet interception, no other routers should be affected.

**NOTE:** If you change the number of seconds between RIP updates (the default is 30), you must specify the same value on the off-path Peribit device. To match this example, enter the following CLI command on the Peribit device:

```
config packet-interception rip set update-timer 5
```

To view the RIP routes advertised by the off-path device, enter the following command:

```
show ip route rip
```

If packet interception is working correctly, you should see routes like the following. In this example, 10.1.14.50 is the off-path device, and the IP address of the remote Peribit device (10.1.203.50) has been carved out.

```
10.1.0.0/16 is variably subnetted, 24 subnets, 9 masks
R   10.1.203.128/25 [30/2] via 10.1.14.50, 00:00:23, Ethernet0/1
R   10.1.203.51/32 [30/2] via 10.1.14.50, 00:00:23, Ethernet0/1
R   10.1.203.48/31 [30/2] via 10.1.14.50, 00:00:23, Ethernet0/1
R   10.1.203.52/30 [30/2] via 10.1.14.50, 00:00:23, Ethernet0/1
R   10.1.203.56/29 [30/2] via 10.1.14.50, 00:00:23, Ethernet0/1
R   10.1.203.32/28 [30/2] via 10.1.14.50, 00:00:23, Ethernet0/1
R   10.1.203.0/27 [30/2] via 10.1.14.50, 00:00:23, Ethernet0/1
R   10.1.203.64/26 [30/2] via 10.1.14.50, 00:00:23, Ethernet0/1
```

To view debugging information for RIP events on a Cisco router:

```
debug ip rip events
```

Sample debugging information:

```
1w1d: RIP: received v2 update from 10.1.14.50 on Ethernet0/1
1w1d: RIP: Update contains 8 routes
```

You can also enter "debug ip rip database" or "debug ip rip trigger" for more details.

### Dual Off-Path Devices on Two Layer 3 Switches

In Figure 4-10, two off-path Peribit devices are connected to dedicated VLANs on two Layer 3 switches. To use Peribit 1 as the preferred device, SW2 is configured to add an offset to the RIP routes advertised by Peribit 2. The two switches exchange RIP routes so that if Peribit 1 fails, the “higher cost” routes from Peribit 2 are used automatically by both switches. Also, Peribit 3 specifies Peribit 1 as the preferred assembler.

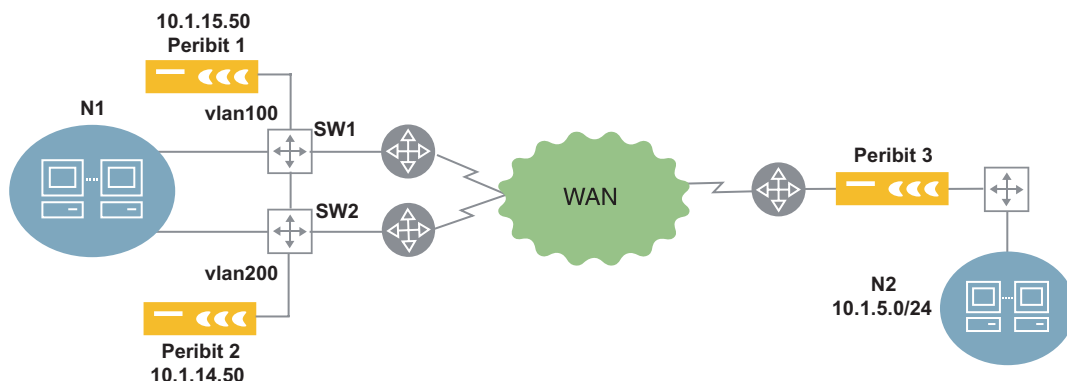


Figure 4-10 Dual Off-Path Peribit Devices on Two Layer 3 Switches

1. Enable RIP on SW1. Note that RIP is not passive because SW1 and SW2 exchange routes.

```
router rip
  version 2
  timers basic 5 15 15 30
  network 10.1.0.0
  distance 30
  no auto-summary
```

2. Enable RIP on SW2 so that a five-hop offset is added to the RIP routes received from Peribit 2 (which are the routes advertised by Peribit 3):

```
access-list 10 permit host 10.1.14.50

router rip
  version 2
  timers basic 5 15 15 30
  offset-list 10 in 5 interface vlan200
  network 10.1.0.0
  distance 30
  no auto-summary
```

Thus, the routes from Peribit 2 have six hops on SW2, and seven hops on SW1, while the same routes from Peribit 1 have one hop on SW1 and two hops on SW2. The routes from Peribit 2 are used only if Peribit 1 fails.

---

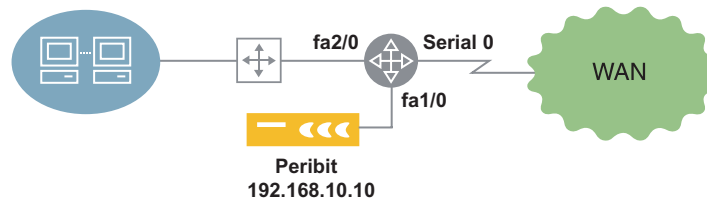
**NOTE:** If you change the number of seconds between RIP updates (the default is 30), you must specify the same value on the off-path Peribit devices. To match this example, enter the following CLI command on the Peribit device:

```
config packet-interception rip set update-timer 5
```

---

## WCCP Router Configuration Commands

The following commands provide an example of how to configure WCCP on a Cisco router for the deployment shown in Figure 4-11. The actual commands used will vary, depending on the network's topology and the type of traffic to be redirected. For more information about WCCP, go to the Cisco documentation page at <http://www.cisco.com/univercd/home/home.htm> and search for "wccp".



**Figure 4-11** Off-Path Peribit Device Connected to a Router

1. Define an access list that specifies the traffic that is eligible for redirection to the Peribit device:

```
access-list 120 permit ip any any
```

2. If the off-path Peribit device assigns WCCP service IDs 85 and 87 to TCP and UDP, respectively, create the two service IDs on the router. Include the password if authentication is enabled.

```
ip wccp 85 redirect-list 120 password <password>
ip wccp 87 redirect-list 120 password <password>
```

3. To redirect traffic from the outbound WAN interface, specify the WCCP service IDs to be redirected:

```
interface Serial 0
ip address 192.168.5.103 255.255.255.0
ip wccp 85 redirect out
ip wccp 87 redirect out
```

Alternatively, to redirect traffic from the inbound interface from the switch:

```
interface FastEthernet 2/0
ip address 192.168.5.103 255.255.255.0
ip wccp 85 redirect in
ip wccp 87 redirect in
```

---

**NOTE:** If you define a service ID on the router, but omit the redirect commands, no traffic is redirected to the Peribit device. However, entering the “show packet-interception” command on the Peribit device will indicate the service is connected.

---

## External Policy-Based Router Commands

The following commands provide examples of how to configure policy-based routing on Cisco routers and Layer 3 switches.

If the off-path device is connected to a dedicated port on a router, the policy is applied to the inbound interface from the LAN switch. In the following example, any incoming packet on interface FastEthernet 0/0 that matches access-list 120 is routed to the Peribit device at IP address 192.168.10.10. The access list shown here redirects all packets, but it can be as specific as necessary.

```
interface FastEthernet 0/0
ip address 192.168.9.1 255.255.255.0
ip policy route-map Peribit

access-list 120 permit ip any any

route-map Peribit permit 50
match ip address 120
set ip next-hop 192.168.10.10
```

If the off-path device is connected to a dedicated VLAN on a Layer 3 switch, the commands are almost the same, except that the policy is applied to the switch on the inbound interface from the LAN:

```
interface Vlan200
ip address 192.168.9.1 255.255.255.0
ip policy route-map Peribit
```

---

**NOTE:** Use the “set ip next-hop” command to redirect packets to the IP address of the Peribit device. Do not use the “set interface” command to redirect traffic to the interface where the Peribit device is connected.

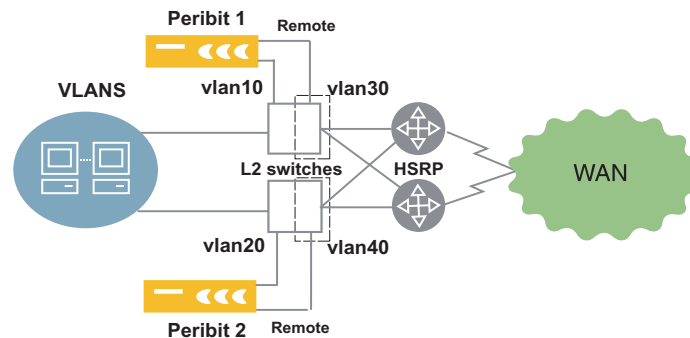
---

## Alternatives to Packet Interception

In some environments, you can install a Peribit device off path by connecting the Local and Remote interfaces to different VLANs on the same switch. Packet interception is not used.

### Layer 2 Switch Sandwich

In the high-availability environment in Figure 4-12, the two Peribit devices are connected in “two-legged” VLANs on two Layer 2 switches. All traffic is switched through the Peribit devices as it passes to and from the WAN routers.



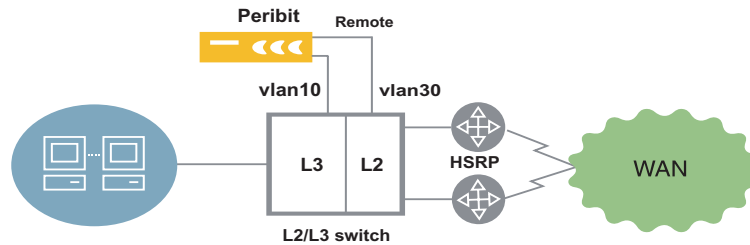
**Figure 4-12 Layer 2 Switch Sandwich**

Note the following:

- The Local interface is placed in the original VLAN that previously connected the switch port to the WAN router.
- The Remote interface is placed in a new VLAN along with the switch ports that feed the WAN routers.
- The default gateway of each Peribit device is the HSRP address of the WAN routers. If one router fails, traffic is directed to the other router.
- Use a cross-over cable to connect the Local interface to the switch so that traffic is blocked if one Peribit device fails. The Layer 3 switches can then route the traffic through the other Peribit device.

### Layer 3 Switch Sandwich

Figure 4-13 shows a single Peribit device connected across Layer 2 and Layer 3 VLANs on an L2/L3 switch. All traffic is switched through the Peribit device as it passes to and from the WAN routers.



**Figure 4-13 Layer 3 Switch Sandwich**

Note the following:

- Hosts on the local LAN must point to the HSRP default gateway on same subnet.
- The Local interface is placed in the original VLAN that previously connected the switch port to the WAN router.
- The Remote interface is placed in a new Layer 2 VLAN along with the switch ports that feed the WAN routers.
- The default gateway of the Peribit device is the HSRP address of the WAN routers. If one router fails, traffic is directed to the other router.

## Configuring Policy-Based Multi-Path

If a pair of Peribit devices has two possible WAN paths between them, you can designate one path as the primary and the other as the secondary. You can then route application traffic to the primary or secondary path based on the performance requirements of the application and the actual performance of the path.

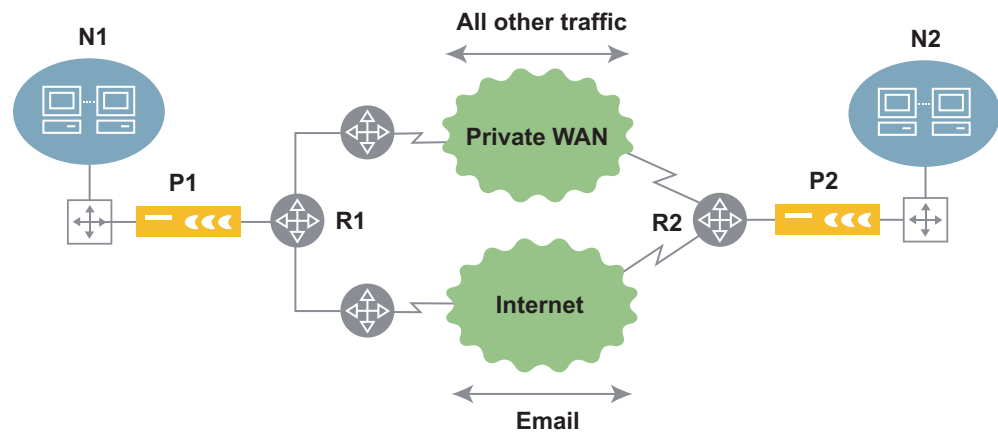
---

**NOTE:** Each Multi-Path endpoint counts as two reduction tunnels.

---

To use Multi-Path, you configure both Peribit devices so that outgoing packets intended for the secondary path are marked with a secondary source IP address and, optionally, with a specific gateway address or ToS/DSCP value. In most cases, you must configure the WAN routers to route the marked packets to the appropriate path. The traffic for the preferred path (primary or secondary) is specified by outbound QoS traffic class, where each class contains one or more applications.

For example, in Figure 4-14, most traffic is normally be sent over the private WAN, while email traffic is sent over the Internet. P1 and P2 mark email traffic with a secondary IP address, and R1 and R2 are configured to route the marked traffic to the Internet. If the private WAN fails, selected application traffic can be diverted automatically to the Internet; if the Internet latency exceeds a specified threshold, email traffic can be diverted to the private WAN. Traffic is switched back to the preferred path when conditions return to normal.



**Figure 4-14 Multi-Path Deployment**

The following topics describe how to configure policy-based, multi-path tunnels:

- [“Procedure for Configuring Multi-Path” in the next section](#)
- [“Enabling Multi-Path and Defining Marking Methods” on page 115](#)
- [“Defining Multi-Path Templates” on page 117](#)
- [“Defining Multi-Path Endpoints” on page 119](#)
- [“Configuring Routers to Support Multi-Path” on page 121](#)



## Procedure for Configuring Multi-Path

To configure Multi-Path for a pair of Peribit devices, do the following on BOTH devices:

1. Verify that the Peribit device that acts as the registration server is running SRS 5.0 or later.
2. Verify that data reduction is enabled between the two Peribit devices (refer to [“Configuring Endpoints for Reduction Tunnels” on page 123](#)).
3. Verify that the appropriate outbound QoS traffic classes are defined (refer to [“Defining Traffic Classes” on page 163](#)). Outbound QoS can be on or off.
4. Enable the multi-path feature and specify a secondary IP address (refer to [“Enabling Multi-Path and Defining Marking Methods” on page 115](#)).
5. Define templates that specify the preferred path (primary or secondary) for each traffic class and the conditions when the traffic for each class can be switched (refer to [“Defining Multi-Path Templates” on page 117](#)).
6. Apply a template to each remote Peribit device that supports Multi-Path, and specify the congestion and latency thresholds for each path (refer to [“Defining Multi-Path Endpoints” on page 119](#)).
7. If necessary, configure the WAN router to route traffic to the appropriate path (refer to [“Configuring Routers to Support Multi-Path” on page 121](#)).
8. Optionally, enable encryption for both paths or just the less-secure path (refer to [“Configuring IP Security \(IPSec\)” on page 189](#)).

## Enabling Multi-Path and Defining Marking Methods

To enable Multi-Path, you must specify a secondary IP address to be used as the source address on all packets to be routed to the secondary path. Optionally, packets sent on the primary and secondary paths can be marked with different gateway addresses or ToS/DSCP values.

To enable Multi-Path:

1. In the Setup page, click **ADVANCED** in the left-hand navigation frame, click **Multi-Path**, and then click **Start/Stop**.

**Peribit-SR**

SETUP REDUCTION QOS ACCELERATION MONITOR ADMIN HELP Logged in as: admin SAVE LOGOUT

**Setup**

BASIC

- Addresses
- Interfaces
- Time
- License Key
- SNMP
- Syslog Server
- Local Routes
- Registration Server

AAA

APPLICATIONS

IPSEC

ADVANCED

- Topology
- Source/Destination Filter
- ARP
- Prime Time
- Packet Interception
- Multi-Path
  - Start/Stop
  - Templates
  - Endpoints

**Multi-Path Start/Stop** HELP

Multi-Path ☐ Enabled ☒ Disabled

Secondary IP Address

**Supplemental Marking Methods**

Gateway IP Primary:  Secondary:

☒ IP Precedence ☐ DSCP Primary:  Secondary:

When Multi-Path is enabled, in the event of network congestion or link failure, traffic is automatically diverted from the Primary path to the Secondary path.

The secondary IP address is used to designate the alternate path and this value must be entered.

Supplemental marking methods can be used to route traffic to the Secondary path. Fill in the fields for those methods you intend to use. Later, on the 'Endpoints' page, you can select the method to use for each Multi-Path enabled endpoint.

**Figure 4-15 Multi-Path Start/Stop Page**

## 2. Specify the following information:

Multi-Path	Select <b>Enabled</b> to activate the multiple-path feature on this device.
Secondary IP Address	<p>Enter an IP address to be used as the source address on packets to be sent on the secondary path (packets sent on the primary path have the device address). The secondary IP address must be unique, and must be on the same subnet as the device address.</p> <p>Unless the WAN routers for the primary and secondary paths are also on this subnet (see <b>Gateway IP</b> below), the default gateway must be configured to route traffic with this source address to the appropriate WAN link (refer to <a href="#">“Configuring Routers to Support Multi-Path” on page 121</a>).</p> <p><b>NOTE:</b> If you enter an address assigned to another device, the path will remain inactive (refer to <a href="#">“Defining Multi-Path Endpoints” on page 119</a>). If you must change the address, do the following:</p> <ol style="list-style-type: none"> <li>1. Enter the new address and click <b>Submit</b>.</li> <li>2. Disable Multi-Path and click <b>Submit</b>, and then enable Multi-Path. The configuration for the old secondary path is disabled, including settings for QoS, PFA, and IPSec.</li> </ol>
<p>Optionally, you can mark packets sent on the primary and secondary paths with different ToS/DSCP values or gateway addresses. You can specify values for both marking methods, but only one method can be used for each remote endpoint that supports Multi-Path.</p>	
Gateway IP	<p>If the WAN routers for the primary and secondary paths are on the same subnet as the Peribit device, and the Peribit device is connected to a Layer 2 switch (see <a href="#">Figure 4-16</a>), enter the gateway IP addresses here.</p> <p>ARP is used to obtain the MAC addresses for the two gateways, and then traffic for the primary and secondary paths is marked with the MAC address of the appropriate gateway. In this case, no additional router configuration is needed.</p>
IP Precedence/DSCP	<p>Select <b>IP Precedence</b> or <b>DSCP</b> and enter a ToS IP precedence value (0 to 7) or DSCP value (0 to 63) for packets sent on the primary and/or secondary paths.</p> <p><b>NOTE:</b> These values override the IP precedence or DSCP settings for:</p> <ul style="list-style-type: none"> <li>• Outbound QoS (refer to <a href="#">“Changing Outbound ToS/DSCP Values” on page 170</a>)</li> <li>• Peribit control packets (refer to <a href="#">“Configure Reduction Command” on page 293</a>)</li> </ul> <p>The multi-path DSCP values also override ToS marking for router-based balancing (refer to <a href="#">“Configure Route Command” on page 306</a>).</p>

3. Click **Submit** to activate the changes, or click **Reset** to discard them.

4. To retain your changes when the device is restarted, click **SAVE** in the menu frame.

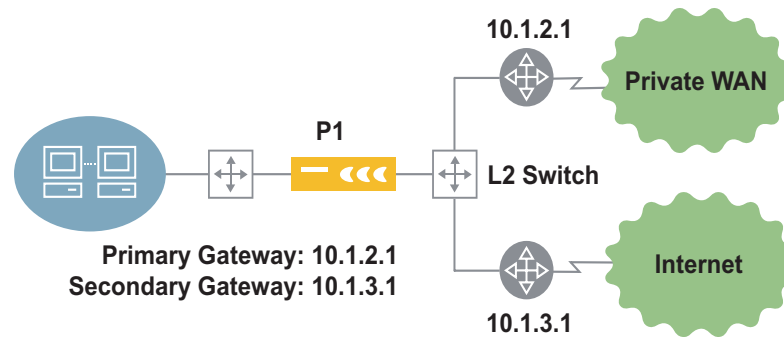


Figure 4-16 Multi-Path with Primary and Secondary Gateways

## Defining Multi-Path Templates

To configure Multi-Path, at least one multi-path template must be defined to specify the preferred path for each traffic class, and the conditions under which the traffic for each class can be switched to the alternate path. To assign a template to each remote Peribit device that supports Multi-Path, refer to [“Defining Multi-Path Endpoints”](#) on page 119.

To define multi-path templates:

1. In the Setup page, click **ADVANCED** in the left-hand navigation frame, click **Multi-Path**, and then click **Templates**.

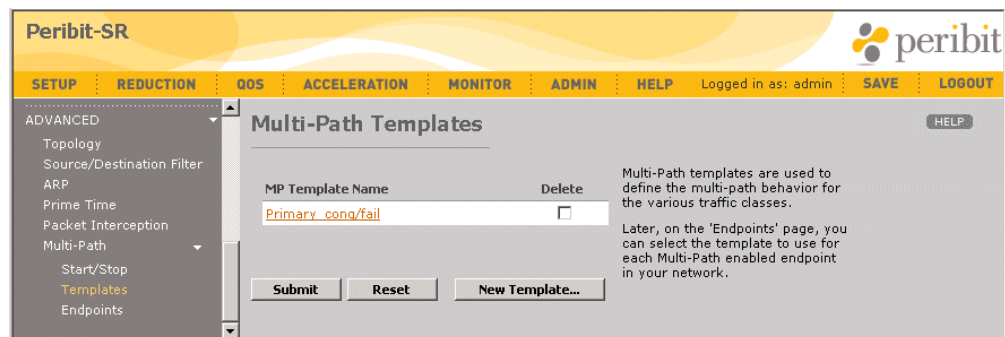


Figure 4-17 Defining Multi-Path Templates

From the Multi-Path Templates page, you can:

- Add a new template, as described in Step 2 through Step 3.
- Change a template name or settings. Click the template name, change the template name and/or the settings for each traffic class, and click **Submit**.
- Delete a template. Click the check box next to the template name, and click **Submit**. If a template is applied to an endpoint, it cannot be deleted.

2. To add a new template, click **New Template** and specify the following information:

Template Name	Enter the template name (up to 20 characters).
For each traffic class, select the following (to add new traffic classes, refer to <a href="#">“Defining Traffic Classes” on page 163</a> ).	
Preferred Path	Select <b>Primary</b> or <b>Secondary</b> to indicate the path used for each traffic class under normal network conditions.
Divert	<p>Select the conditions under which each traffic class can be switched to the alternate path:</p> <ul style="list-style-type: none"> <li>• <b>Never.</b> The traffic class is never diverted from the preferred path.</li> <li>• <b>Failure Only.</b> The traffic class is diverted to the alternate path only if the reduction tunnel for the preferred path goes down and the reduction tunnel for the alternate path is active.</li> <li>• <b>Congestion/Failure.</b> The traffic class is diverted to the alternate path if the loss or latency threshold is exceeded on the preferred path or the reduction tunnel goes down. A diversion for loss or latency occurs only if the alternate path’s loss and latency are not exceeded.</li> </ul> <p>If <b>Congestion/Failure</b> is selected for any traffic class, probe packets are sent to the remote devices to measure the loss and latency of each path. To specify a latency threshold for each remote device, refer to <a href="#">“Defining Multi-Path Endpoints” on page 119</a>. By default, the loss threshold is exceeded if two or more probes are lost per minute for four consecutive minutes.</p> <p>All of the threshold settings can be changed using the CLI (refer to <a href="#">“Configure Multi-Path Command” on page 278</a>).</p>

---

**NOTE:** Outbound QoS settings do not affect how traffic is diverted between alternate paths.

---

3. Click **Submit** to activate the changes, or click **Reset** to discard them.
4. To retain your changes when the device is restarted, click **SAVE** in the menu frame.

## Defining Multi-Path Endpoints

After you specify a Multi-Path secondary IP address for one or more remote Peribit devices, you can assign a Multi-path template to each remote endpoint, and specify the latency threshold and supplemental marking method (if any) for each path.

To define Multi-Path endpoints:

1. In the Setup page, click **ADVANCED** in the left-hand navigation frame, click **Multi-Path**, and then click **Endpoints**.

**Peribit-SR**

SETUP REDUCTION QOS ACCELERATION MONITOR ADMIN HELP Logged in as: admin SAVE LOGOUT

**Setup**

BASIC

- Addresses
- Interfaces
- Time
- License Key
- SNMP
- Syslog Server
- Local Routes
- Registration Server

AAA

APPLICATIONS

IPSEC

ADVANCED

- Topology
- Source/Destination Filter
- ARP
- Prime Time
- Packet Interception
- Multi-Path
  - Start/Stop
  - Templates
  - Endpoints**

**Multi-Path Endpoints**

When Multi-Path is enabled, in the event of network congestion or link failure, outbound traffic destined for the checked Peribit devices is diverted to alternate paths according to conditions defined by the selected Multi-Path Template and Supplemental Marking Method.

Use the 'Start/Stop' page to enable or disable Multi-Path and to specify supplemental marking methods. Use the 'Templates' page to view and modify templates.

Only endpoints which have been selected for Reduction and which have a secondary IP address can be enabled for Multi-Path. If an endpoint has been disabled and you want to enable Multi-Path, go to Reduction/Endpoints page and enable Reduction for it and go to that device and set the secondary IP address on it.

Device Name	Status		Latency Threshold (msec)		Multi-Path Template	Supplemental Marking Method
	Pri.	Sec.	Primary	Secondary		
<input checked="" type="checkbox"/> SR-10.15.2.12	●	✖	50	75	Primary_cong/fail	None (Sec. IP only)
<input checked="" type="checkbox"/> SR-10.2.2.32	●	●	50	100	Primary_cong/fail	None (Sec. IP only)

Select All Clear

Submit Reset

**Figure 4-18 Defining Multi-Path Endpoints**



Remote devices that are greyed out do not have a secondary IP address defined (refer to [“Enabling Multi-Path and Defining Marking Methods” on page 115](#)).

2. To enable Multi-Path between this device and a remote endpoint, select the check box next to the remote endpoint's primary IP address, and specify the following:

Latency Threshold	<p>Enter the latency threshold in milliseconds (20 to 5000) for the primary and secondary paths. Traffic is switched to the alternate path when the threshold is exceeded, and is switched back when latency drops below the threshold. This setting is ignored for traffic classes where the selected template disallows switching between paths.</p> <p><b>NOTE:</b> If you set the threshold too low, minor fluctuations in latency may cause constant switching between paths.</p> <p>By default, a probe tests the path 12 times per minute, and traffic is switched when the threshold is exceeded at least four times per minute for four consecutive minutes. Traffic is also switched if two or more probes are lost per minute for four consecutive minutes. To change these settings, refer to <a href="#">“Configure Multi-Path Command” on page 278</a>.</p>
Multi-Path Template	<p>Select a template for this endpoint that specifies the preferred path and the conditions under which traffic can be switched to the alternate path. To add a new template, refer to <a href="#">“Defining Multi-Path Templates” on page 117</a>.</p>
Supplemental Marking Method	<p>Optionally, select one of the additional marking methods for the packets sent on each path (refer to <a href="#">“Enabling Multi-Path and Defining Marking Methods” on page 115</a>). By default, all packets to be sent on the secondary path have the source address set to the secondary IP address.</p>

3. Click **Refresh** to update the icons in the **Status** column. The following icons are used to indicate the status of the primary and secondary paths of each multi-path endpoint:

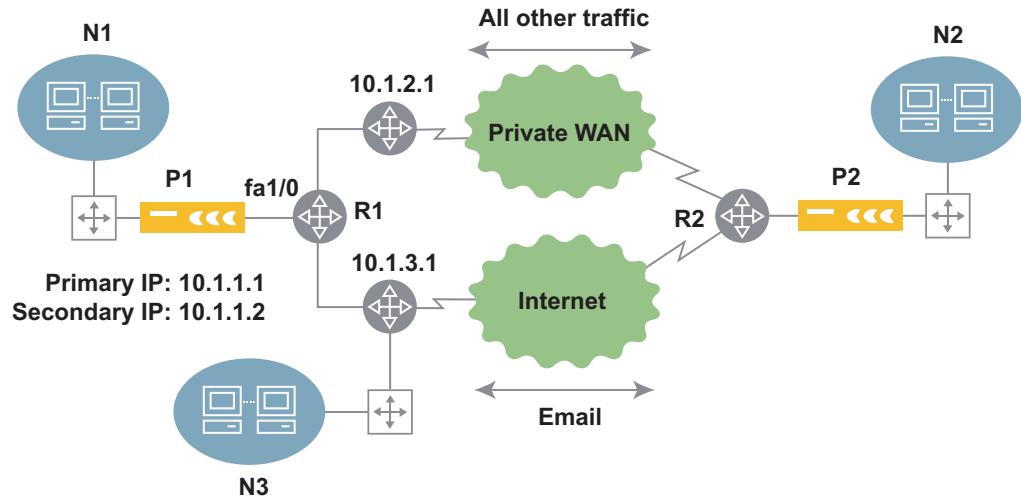
Table 4-2 Multi-Path Icon Descriptions

Icon	Description
	The reduction tunnel is up and the path's loss and latency are below the specified thresholds.
	<p>Connection or performance problem. Move the cursor over the icon to see which one of the following conditions applies.</p> <ul style="list-style-type: none"> <li>• No secondary IP address for the remote endpoint (the address specified may belong to another device)</li> <li>• Outbound reduction tunnel is down</li> <li>• Loss threshold exceeded</li> <li>• Latency threshold exceeded</li> </ul> <p>Note that when loss or latency thresholds are exceeded, traffic is switched to the alternate path only if the alternate reduction tunnel is up and the loss and latency are below the specified thresholds. If a reduction tunnel is down, traffic is switched to the alternate path regardless of alternate's performance (provided the alternate reduction tunnel is up).</p>

4. Click **Submit** to activate the changes, or click **Reset** to discard them.
5. To retain your changes when the device is restarted, click **SAVE** in the menu frame.

## Configuring Routers to Support Multi-Path

You can configure a WAN router to select a gateway for multi-path traffic based on the source IP address, or based on the source address and a ToS or DSCP value. The following configuration examples apply to router R1 in Figure 4-19. A similar configuration is needed for R2.



**Figure 4-19 Multi-Path Router Configuration Example**

To configure the WAN router R1 to use only the source IP address:

1. On the inbound interface from the Peribit device, define a route map for Multi-Path. For example:

```
interface FastEthernet 1/0
  ip address 10.1.1.5 255.255.255.0
  ip policy route-map mpath
```

2. Define access lists for the primary and secondary source IP addresses. For example:

```
access-list 50 permit 10.1.1.1
access-list 51 permit 10.1.1.2
```

3. Match the primary and secondary source IP addresses with the appropriate primary and secondary gateways. For example:

```
route-map mpath permit 10
  match ip address 50
  set ip next-hop 10.1.2.1

route-map mpath permit 20
  match ip address 51
  set ip next-hop 10.1.3.1
```

To configure R2, use the commands above, but change the interface address and use the primary and secondary address for Peribit P2.



To configure the WAN router R1 to use both the source address and the ToS IP precedence or DSCP values:

1. Define a route map for Multi-Path (see the previous example).
2. Define extended access lists for the primary and secondary source IP addresses and their associated IP precedence or DSCP values. For example, for IP precedence values:

```
access-list 100 permit ip host 10.1.1.1 any precedence 10
access-list 101 permit ip host 10.1.1.2 any precedence 11
```

For DSCP values:

```
access-list 100 permit ip host 10.1.1.1 any dscp 1
access-list 101 permit ip host 10.1.1.2 any dscp 2
```

3. Match the primary and secondary source IP addresses with the appropriate primary and secondary gateways. For example:

```
route-map mpath permit 10
  match ip address 100
  set ip next-hop 10.1.2.1

route-map mpath permit 20
  match ip address 101
  set ip next-hop 10.1.3.1
```

---

**NOTE:** Unless you use a console server to manage Peribit devices, you may need to change the access lists to allow management access from some locations using SSH or Web/SSL. For example, in Figure 4-19, you may not be able to access P1 from N3 because management responses have the primary IP address, and are routed to the private WAN.

---



## Chapter 5    **Configuring Reduction Policies**

---

This chapter describes how to configure basic and advanced reduction policy settings through the Web Console.

- [“Configuring Basic Reduction Policies” in the next section](#)
- [“Configuring Advanced Reduction Policies” on page 131](#)

### **Configuring Basic Reduction Policies**

The following topics describe how to configure basic reduction policies:

- [“Configuring Endpoints for Reduction Tunnels” in the next section](#)
- [“Advertising Reduction Subnets” on page 126](#)
- [“Configuring Network Sequence Mirroring” on page 128](#)
- [“Reducing and Monitoring Applications” on page 130](#)

#### **Configuring Endpoints for Reduction Tunnels**

When you install a new Peribit device and specify a registration server, the device attempts to form a reduction tunnel with each registered device, or “endpoint,” in the same Peribit community. The existing devices also attempt to form tunnels with the new device, so that each device can have two types of tunnels—OUT tunnels that convey reduced data to remote devices, and IN tunnels that convey the reduced data to be assembled.

Data reduction and assembly begins automatically for the reduction subnets that are advertised (refer to [“Advertising Reduction Subnets” on page 126](#)). At any time, you can disable data assembly and/or reduce data only for specific Peribit devices in the community.

To configure the endpoints for reduction tunnels:

1. Click **REDUCTION** in the menu frame.

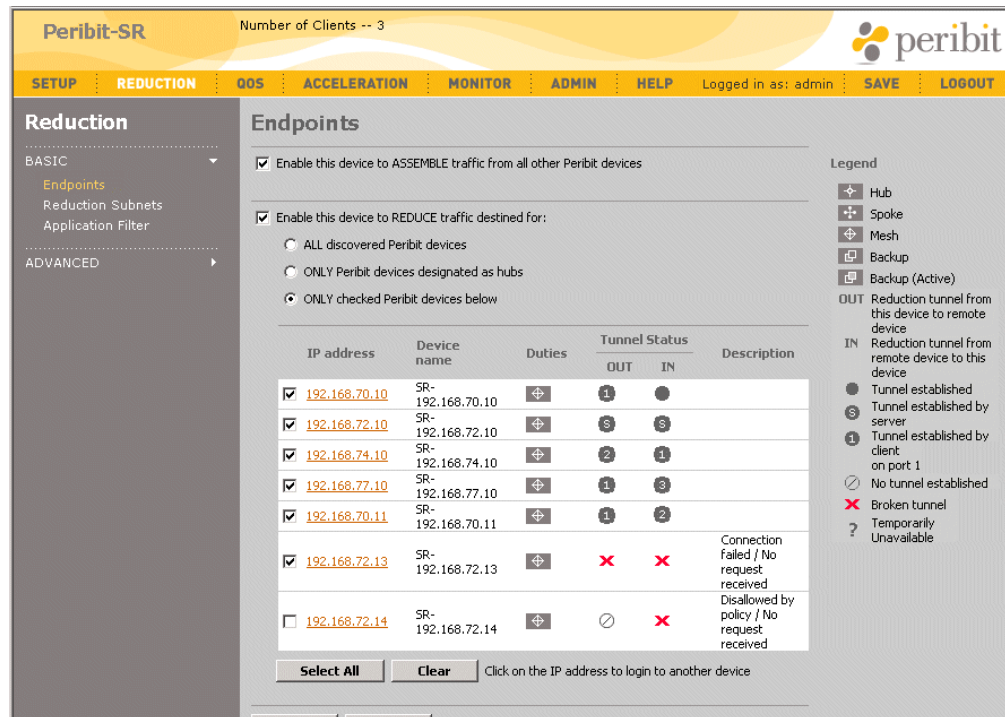










Figure 5-1 Configuring Endpoints for Reduction Tunnels

2. To stop this device from assembling reduced data, clear the **Enable this device to ASSEMBLE traffic from all other Peribit devices** check box. All Peribit devices in the community will stop reducing data for this device.
3. To stop this device from reducing data for other devices, clear the **Enable this device to REDUCE traffic destined for:** check box. Otherwise, select one of the following options:
  - **All discovered Peribit devices.** Data is reduced for all other Peribit devices (default).
  - **ONLY Peribit devices designated as hubs.** Data is reduced only for Peribit devices designated as a hub.
  - **ONLY checked Peribit devices below.** Data is reduced only for the selected Peribit devices. Click the check box next to the IP address of the appropriate devices. To select all devices, click **Select All**. To deselect all devices, click **Clear**.

Note the following about the list of devices:

- To access another device, click the IP address and enter the administrator user name and password for the device.
- The following icons are used in the **Duties** and **Tunnel Status** columns. The **IN** column indicates the status of the tunnel from the remote device; the **OUT** column indicates the status of the tunnel from this device to the remote device.

**Table 5-1 Endpoint Icon Descriptions**

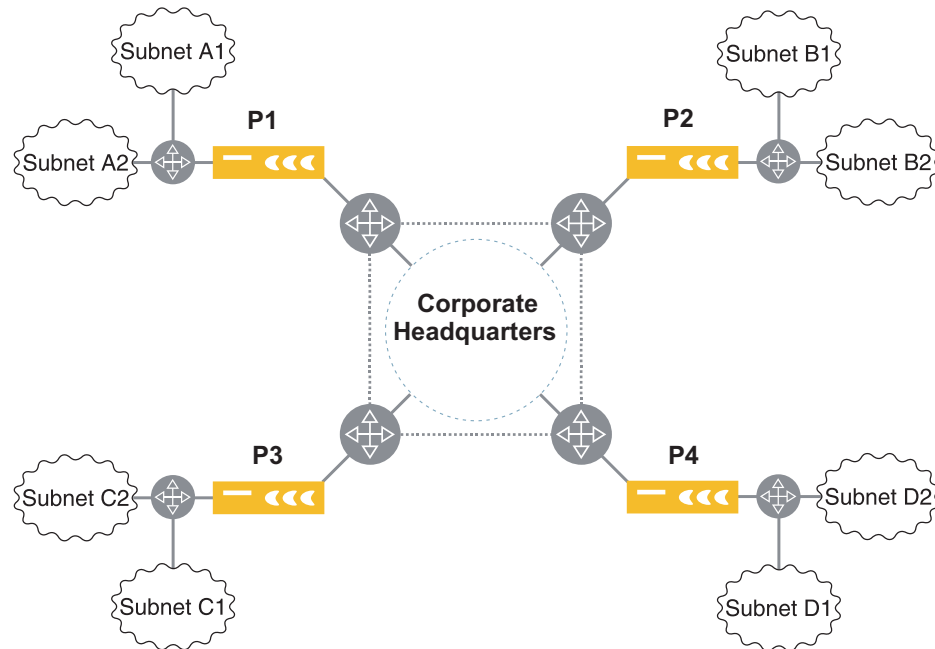
Icon	Description
	<b>Hub</b> — The device is designated as a hub in the Peribit community. Each device attempts to form a reduction tunnel with a hub before creating tunnels to other Peribit devices (refer to <a href="#">“Setting Community Topology Parameters” on page 97</a> ).
	<b>Spoke</b> — The device is designated as a spoke in a Hub and Spoke topology. By default, a spoke reduces and assembles data only for the hub device(s).
	<b>Mesh</b> — The device is designated as part of a mesh topology.
	<b>Backup</b> — The device is designated as backup for one or more primary devices. The icon flashes when the backup device is active. To configure a device as a backup, refer to <a href="#">“Configure Backup Command” on page 268</a> .
	<b>Tunnel established</b> — A reduction tunnel exists between this Peribit device and the remote device at the specified IP address. On an SR-100 that has one or more clients, an “S” or a number (1 to 6) is enclosed in the circle to indicate whether the server (the SR-100) or a client is handling the tunnel. The number indicates the port on the SR-100 where the client is connected (also called the client ID). Note that remote devices see only the SR-100, not the clients.
	<b>No tunnel established</b> — No reduction tunnel exists between this device and the remote device due to a policy setting.  For example, if you manually disable data reduction to a remote device by clearing the check box next to its IP address, this icon is displayed in the <b>OUT</b> column, and the message “Disallowed by policy” is displayed in the <b>Description</b> column.
	<b>Broken tunnel</b> — No reduction tunnel exists between this device and the remote device because of a policy setting or an error.  Note that if you manually disable data reduction to a remote device, this icon is displayed in the corresponding <b>IN</b> column on the remote device, and the message “No request received” is displayed in the <b>Description</b> column.
	<b>Temporarily unavailable</b> — The reduction tunnel is in a transitory state.

4. Click **Submit** to activate the changes, or click **Reset** to discard them.
5. To retain your changes when the device is restarted, click **SAVE** in the menu frame.

## Advertising Reduction Subnets

Reduction subnets are the subnets on the LAN side of the Peribit device that you can selectively advertise to the other devices in the Peribit community. The other devices can then reduce and accelerate traffic sent to the advertised subnets. Initially, the only reduction subnet is the subnet where the Peribit device is installed. To identify more LAN-side subnets, refer to [“Configuring Local Routes” on page 67](#).

The set of subnets advertised by each device is called a “netmap.” By default, only the subnets you select are advertised. You can enable the advertisement of all subnets or just selected subnets. Figure 5-2 shows four Peribit devices, each with two subnets on its Local side.



**Figure 5-2** Selecting Specific Subnets for Data Reduction

To disable data reduction for Subnet D1, log in to P4 and deselect Subnet D1 on the Reduction Subnet list. Data from other subnets that is destined for Subnet D1 passes through the Peribit community without reduction. Data that is destined for Subnet D2 is still reduced by the other Peribit devices and assembled by P4.

For further control of the traffic being reduced, you can specify application filters, as described in [“Reducing and Monitoring Applications” on page 130](#), and source/destination filters, as described in [“Filtering Data Reduction by Source and Destination” on page 100](#).

If a Peribit device has 4000 or more reduction subnets, it may take considerable time to load them into the Web console. In this case, you may want to use the CLI to view and configure the reduction subnets. For more information, refer to [“Configure Reduction Subnets Command” on page 301](#).

---

**NOTE:** If a host or gateway in an advertised subnet becomes unreachable, the Peribit device dynamically adjusts the advertised subnets to exclude (“carve out”) the unreachable address. To view the most recent advertised subnets, refer to [“Viewing and Fetching Remote Routes” on page 132](#). To disable the carve-out feature (refer to [“Configure Reduction Subnets Command” on page 301](#)).

---

To advertise reduction subnets:

1. Click **REDUCTION** in the menu frame, and then click **Reduction Subnets** in the left-hand navigation frame.

**Figure 5-3** Configuring Reduction Subnets

The **Cost** column is not the standard routing cost, but an internal value used to calculate the cost of reduction tunnels. The **Interface** column indicates whether the route was discovered on the Local or Remote interface.

**NOTE:** Normally, reduction subnets include only subnets discovered on the Local interface (the LAN side). Subnets discovered on the WAN side are included if the device is installed off-path (refer to “[Configuring Packet Interception](#)” on page 104) or if the WAN reduction subnet option is enabled manually (refer to “[Configure Reduction Subnets Command](#)” on page 301). The WAN option is useful when local routes are discovered on the Remote interface, such as in some VLAN environments.

For an off-path device, the interface value is “N/A”, so be careful to advertise only the true LAN-side subnets.

2. Select one of the following parameters for the reduction subnet list:
  - **Advertise ALL subnets.** Advertises all subnets in the list to all the devices in the Peribit community. This option is not available when the WAN reduction subnet option is enabled.
  - **Advertise checked subnets ONLY.** Advertises only the selected subnets. Select the subnets in the list that you want to advertise.
  - **Advertise all subnets EXCEPT checked.** Advertises all subnets in the list, except those that are checked. Select the subnets that you do NOT want to advertise.

Note that changes to advertised subnets are propagated to the other devices immediately. However, if reduction is disabled, changes are propagated every hour unless the fetch interval is changed (refer to “[Viewing and Fetching Remote Routes](#)” on page 132).



3. Click **Submit** to activate the changes, or click **Reset** to discard them.
4. To retain your changes when the device is restarted, click **SAVE** in the menu frame.

## Configuring Network Sequence Mirroring

Network Sequence Mirroring (NSM) is an enhanced data reduction technique available on Peribit Sequence Mirror (SM) devices. NSM uses disk storage to identify longer patterns of repeated traffic, and to retain those patterns for longer periods of time (even when a reduction tunnel is down). NSM is most effective where large files are often sent over the WAN, such as for database backups.

Disk icons displayed in the banner of a Sequence Mirror device indicate the status of the hard disk(s):

**Table 5-2 Disk Icon Descriptions**

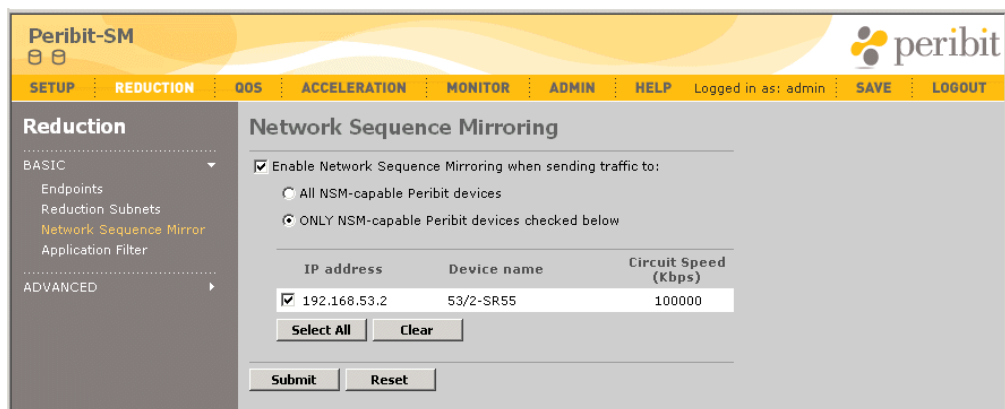
Icon	Description
	The hard disk is operating normally.
	The hard disk has failed. On the SM-250, NSM stops and only MSR is used for reduction; on the SM-500, NSM continues operation unless the second disk also fails. Contact Peribit Technical Support about any disk failures.

To use NSM between two Sequence Mirror devices, a reduction tunnel must exist between them (refer to [“Configuring Endpoints for Reduction Tunnels” on page 123](#)), and Active Flow Pipelining (AFP) and outbound QoS must be enabled on both devices (refer to [“Enabling Packet Flow Acceleration by Endpoint” on page 182](#)). Applications that are enabled for AFP can then be enabled for NSM (refer to [“Reducing and Monitoring Applications” on page 130](#)).

When you install a new Sequence Mirror, reduction tunnels, outbound QoS, AFP, and NSM are enabled automatically between the new device and all other Sequence Mirrors in the community. At any time, you can disable NSM for selected endpoints and applications.

To configure NSM for remote Sequence Mirror devices:

1. Click **REDUCTION** in the menu frame, and then click **Network Sequence Mirror** in the left-hand navigation frame.



**Figure 5-4 Configuring Endpoints for Network Sequence Mirroring**



2. To disable NSM on this device so that standard data reduction is used for all remote devices, clear the **Enable Network Sequence Mirroring...** check box. Otherwise, select one of the following options:
  - **All NSM-capable Peribit devices.** NSM is used for all remote Sequence Mirror devices in the community (default).
  - **ONLY NSM-capable Peribit devices checked below.** NSM is used only for the selected Sequence Mirror devices. Click the check box next to the IP address of the appropriate devices. To select all devices, click **Select All**. To deselect all devices, click **Clear**.
3. Click **Submit** to activate the changes, or click **Reset** to discard them.
4. To retain your changes when the device is restarted, click **SAVE** in the menu frame.

## Reducing and Monitoring Applications

For each application, you can enable or disable data reduction, Network Sequence Mirroring (NSM), and application monitoring. Monitoring a reduced application lets you view reduction and acceleration statistics for the application. You can monitor up to 40 reduced applications. All unreduced or unmonitored applications are placed in the “Others” category on reports. For more information about monitoring statistics, refer to [“Viewing Results” on page 201](#).

Application definitions are provided for applications with well-known port numbers. All other applications are grouped together as “Undefined”. If the undefined applications are reduced, they are monitored automatically. To define additional applications, refer to [“Managing Applications” on page 90](#).

To select applications to be reduced and monitored:

1. Click **REDUCTION** in the menu frame, and then click **Application Filter** in the left-hand navigation frame.

**Peribit-SM**

SETUP REDUCTION QOS ACCELERATION MONITOR ADMIN HELP Logged in as: admin SAVE LOGOUT

**Reduction**

BASIC

- Endpoints
- Reduction Subnets
- Network Sequence Mirror
- Application Filter**

ADVANCED

**Application Filter**

Application name	Reduce	Network Sequence Mirror	Monitor
AOL	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
CIFS	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Clearcase	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
CVS	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
DNS	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Exchange	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Filenet	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
FTP	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Groupwise	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Hostname Resolution	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
HTTP	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
HTTPS	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ICA	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Kerberos	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
LDAP	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
XWindows	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Undefined applications	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Only applications checked in the 'Reduction' column will be reduced. Unchecked applications will be passed through without reduction.

If Network Sequence Mirroring (NSM) is enabled for traffic destined for NSM-capable Peribit devices (See the "Network Sequence Mirror" page.) then applications checked in the "Network Sequence Mirror" column will be reduced using NSM.

Applications for which Active Flow Pipelining (AFP) have not been enabled cannot be enabled for NSM.

Only applications checked in the 'Monitor' column will be included in reports displayed under the 'Monitor' tab.

Reduce All NSM All Clear

Submit Reset

**Figure 5-5 Selecting Applications for Reduction and Monitoring**

2. To view or change an application’s definition, click an application name, make any needed changes, and click **Submit**.

3. Enable or disable the following options for each application:.

Reduce	<p>Select the check box next to each application to be reduced. By default, all applications are reduced (except Groupwise, HTTPS, SMTP, SSH, and Traceroute). If an application is not reduced, its traffic passes through the device without reduction. To reduce all applications, click <b>Reduce All</b>.</p> <p>To conserve processing capacity, disable reduction for applications whose traffic is encrypted or already compressed. However, you must reduce all TCP applications that you want to accelerate (refer to <a href="#">“Configuring Packet Flow Acceleration” on page 177</a>).</p>
Network Sequence Mirror	<p>On a Sequence Mirror device, you can enable Network Sequence Mirroring (NSM) for reduced applications (enabled by default for most applications). If NSM is enabled for one or more remote Sequence Mirror devices (refer to <a href="#">“Configuring Network Sequence Mirroring” on page 128</a>), then NSM is used to reduce the application traffic sent to those devices.</p> <p>NSM uses disk storage to identify longer patterns of repeated traffic (including entire files), and is most effective for applications that do large data transfers. Standard reduction is used for traffic sent to Sequence Reducers or to Sequence Mirrors where NSM is disabled.</p> <p>To enable NSM for all reduced applications, click <b>NSM All</b>. To use NSM for an application, the application must be enabled for reduction and for Active Flow Pipelining (refer to <a href="#">“Enabling Active Flow Pipelining by Application” on page 188</a>).</p>
Monitor	<p>Select the check box next to each reduced application (up to 40) for which you want to view reduction and acceleration statistics.</p> <p>All unreduced or unmonitored applications are placed in the “Others” category on reports.</p> <p><b>NOTE:</b> If you disable monitoring for an application, its historical monitoring statistics are permanently moved to the “Others” application category on the reduction and acceleration reports.</p>

4. Click **Submit** to activate the changes, or click **Reset** to discard them.

5. To retain your changes when the device is restarted, click **SAVE** in the menu frame.

## Configuring Advanced Reduction Policies

The following topics describe the advanced data reduction policies:

- [“Viewing and Fetching Remote Routes” in the next section](#)
- [“Configuring Load Balancing Policies” on page 133](#)
- [“Defining Default Assemblers” on page 135](#)
- [“Defining Preferred Assemblers” on page 137](#)
- [“Configuring Tunnel Mode Settings” on page 138](#)
- [“Configuring Pre-Synchronization for Network Sequence Mirroring” on page 139](#)
- [“Configuring Tunnel Switching in Hierarchical Deployments” on page 141](#)

## Viewing and Fetching Remote Routes

Remote routes are the reduction subnets advertised by the other Peribit devices in the community. Each Peribit device can reduce only the traffic that is destined for a remote route advertised by another Peribit device. You can view the remote routes to determine which routes are advertised by multiple devices. You can also specify how often remote routes are fetched from the other devices, and enable a test to validate each remote route. The set of subnets advertised by each device is called a netmap.

**NOTE:** The remote routes shown for a device may not match the list of advertised subnets shown on the device. Each Peribit device dynamically adjusts its advertised subnets to exclude (carve out) unreachable addresses. To exclude an address from an advertised subnet, multiple smaller subnets are generated, so that one advertised subnet may produce several remote routes. To disable the carve-out feature, refer to [“Configure Reduction Subnets Command” on page 301](#).

To view the remote routes:

1. Click **REDUCTION** in the menu frame, click **ADVANCED** in the left-hand navigation frame, and then click **Remote Routes**.

**Peribit-SR**

SETUP REDUCTION QOS ACCELERATION MONITOR ADMIN HELP Logged in as: admin SAVE LOGOUT

**Reduction**

BASIC

- Endpoints
- Reduction Subnets
- Application Filter

ADVANCED

- Remote Routes
- Load Balancing
- Default Assemblers
- Preferred Assemblers
- Tunnel Mode

**Remote Routes**

8 subnets are advertised by remote Peribit devices in this community

IP Address	Subnet Mask	Assembler IP	Cost	Route Type	Last Update
192.168.5.0	255.255.255.240	192.168.5.131	1	Dynamic	09-23-2003, 10:16
192.168.5.16	255.255.255.248	192.168.5.131	1	Dynamic	09-23-2003, 10:16
192.168.5.24	255.255.255.252	192.168.5.131	1	Dynamic	09-23-2003, 10:16
192.168.5.28	255.255.255.254	192.168.5.131	1	Dynamic	09-23-2003, 10:16
192.168.5.30	255.255.255.255	192.168.5.131	1	Dynamic	09-23-2003, 10:16
192.168.5.32	255.255.255.224	192.168.5.131	1	Dynamic	09-23-2003, 10:16
192.168.5.64	255.255.255.192	192.168.5.131	1	Dynamic	09-23-2003, 10:16
192.168.5.128	255.255.255.128	192.168.5.131	1	Dynamic	09-23-2003, 10:16

It is recommended that the Route Validation feature be turned off when a load balancing policy is in effect.

Fetch advertised routes:   ☐ Validate advertised routes

**Figure 5-6** Displaying and Updating Remote Routes

The **Assembler IP** column shows the address of one or more remote devices that can assemble data for the specified subnet. The **Cost** column indicates the relative cost of the route for each device. Static routes have the highest cost (1000). The lowest cost device is used whenever possible. Load balancing can be used when multiple devices have equal cost paths, as described in [“Configuring Load Balancing Policies” in the next section](#).

2. To change how often the remote routes are fetched from the other Peribit devices in the community, select a frequency from the drop-down menu at the bottom of the page. To update the remote routes immediately, click **Fetch Now**.

Note that remote routes are advertised each time a device starts, and route changes are advertised as soon as they occur. However, if reduction is disabled, the advertisement of route changes depends on the fetch interval. Fetching routes periodically helps ensure the consistency of routing information across all the devices in the community.

3. To test the validity of each route, click **Validate advertised routes**. Each time remote routes are advertised or fetched, three probe packets are sent to three representative IP addresses in each advertised subnet. If the remote Peribit device receives any of the probes, it discards the probes without forwarding them, and returns a report to the sending device (over TCP). If a report is not received in one minute, the route is dropped from the remote routes.

---

**NOTE:** Enable this test only if the validity of the remote routes is in question. You should not use this option if load balancing is enabled (refer to [“Configuring Load Balancing Policies”](#) on page 133).

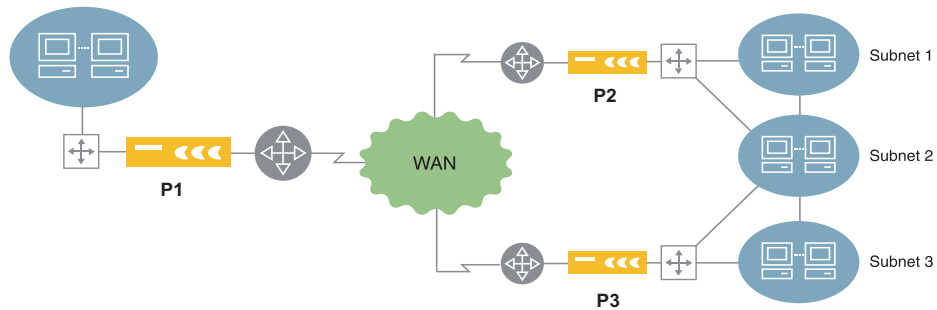
---

4. Click **Submit** to activate the changes, or click **Reset** to discard them.
5. To retain your changes when the device is restarted, click **SAVE** in the menu frame.

## Configuring Load Balancing Policies

If two or more devices in the same Peribit community have equal cost paths to the same subnet, you can use load balancing to share the load of assembling the reduced data. Alternatively, you can specify preferred assemblers, as described in [“Defining Preferred Assemblers”](#) on page 137. If neither load balancing nor preferred assemblers are used, the path selection is arbitrary.

For example, in Figure 5-7, Peribit devices P2 and P3 advertise a local route to Subnet 2. On P1, the two routes to Subnet 2 have equal cost paths, and are grouped together in the Remote Routes page (Figure 5-8).



**Figure 5-7** Configuring Load Balancing Policies

Peribit-SR

SETUP REDUCTION QOS ACCELERATION MONITOR ADMIN HELP Logged in as: admin SAVE LOGOUT

**Reduction**

BASIC

- Endpoints
- Reduction Subnets
- Application Filter

ADVANCED

- Remote Routes
- Load Balancing
- Default Assemblers
- Preferred Assemblers
- Tunnel Mode

**Remote Routes**

8 subnets are advertised by remote Peribit devices in this community

IP Address	Subnet Mask	Assembler IP	Cost	Route Type	Last Update
192.168.5.0	255.255.255.240	192.168.5.131	1	Dynamic	09-23-2003, 10:16
		192.168.52.22	1	Dynamic	09-23-2003, 10:16
192.168.5.16	255.255.255.248	192.168.5.131	1	Dynamic	09-23-2003, 10:16
192.168.5.24	255.255.255.252	192.168.5.131	1	Dynamic	09-23-2003, 10:16
192.168.5.28	255.255.255.254	192.168.5.131	1	Dynamic	09-23-2003, 10:16
192.168.5.30	255.255.255.255	192.168.5.131	1	Dynamic	09-23-2003, 10:16
192.168.5.32	255.255.255.224	192.168.5.131	1	Dynamic	09-23-2003, 10:16
192.168.5.64	255.255.255.192	192.168.5.131	1	Dynamic	09-23-2003, 10:16
192.168.5.128	255.255.255.128	192.168.5.131	1	Dynamic	09-23-2003, 10:16

Common destinations with equal cost paths

It is recommended that the Route Validation feature be turned off when a load balancing policy is in effect.

Fetch advertised routes:   ☐ Validate advertised routes

Figure 5-8 Remote Routes with Equal Cost Paths

To configure load balancing policies:

1. Click **REDUCTION** in the menu frame, click **ADVANCED** in the left-hand navigation frame, and then click **Load Balancing**.

Peribit-SR

SETUP REDUCTION QOS ACCELERATION MONITOR ADMIN HELP Logged in as: admin SAVE LOGOUT

**Reduction**

BASIC

- Endpoints
- Reduction Subnets
- Application Filter

ADVANCED

- Remote Routes
- Load Balancing
- Default Assemblers
- Preferred Assemblers
- Tunnel Mode

**Load Balancing**

The rule selected below determines how traffic is routed when more than one reduction tunnel exists for a given subnet. The selected rule also applies to Default Assemblers if more than one has been specified.

It is recommended that the Route Validation feature be turned off when a load balancing policy is in effect.

☒ Off All traffic is routed to one of the available tunnels.

☐ Per-destination Traffic is distributed over available tunnels based on destination IP address.

☐ Per-packet Traffic is distributed over available tunnels on a per-packet basis, i.e. round robin.

☐ Flow based Traffic is distributed over available tunnels based on source and destination IP addresses and ports.

Figure 5-9 Configuring Load Balancing Policies

2. Select one of the following load balancing policies when multiple equal cost paths exist:
  - **Off.** (Default) All traffic is routed to one of the available tunnels. No load balancing.
  - **Per-destination.** Traffic is distributed over available tunnels based on destination IP address.
  - **Per-packet.** Traffic is distributed over available tunnels on a per-packet basis (round robin).
  - **Flow based.** Traffic is distributed over available tunnels based on source and destination IP addresses and ports. If there are two or more paths in both directions, the outgoing traffic may not use the same path as the return traffic.

3. Click **Submit** to activate the changes, or click **Reset** to discard them.
4. To retain your changes when the device is restarted, click **SAVE** in the menu frame.

## Defining Default Assemblers

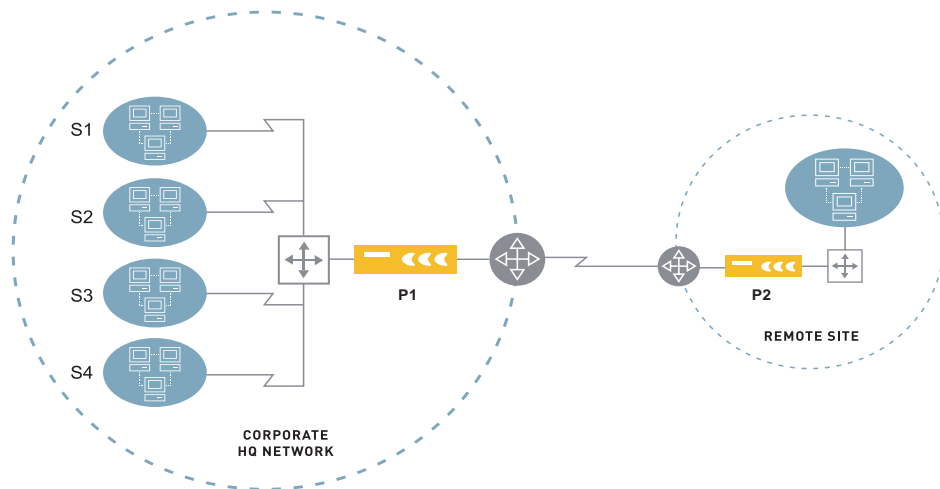
You can sometimes simplify route administration by designating a Peribit device as the default assembler for one or more remote devices. The default assembler need not discover and advertise all of its local routes because the remote devices automatically reduce and forward any traffic that uses the default route. In general, the default route is used when no other route is available (such as to another Peribit device). Note that outbound QoS and IPSec encryption also use default assemblers, regardless of whether reduction is enabled.

For example, in a Hub and Spoke topology, on each spoke device you might designate the hub as the default assembler. This ensures that all traffic goes to the hub, including the traffic destined for other spokes.

Note that traffic sent to the default assembler is not reduced when:

- The sending device has a static or dynamic route to one of the default assembler's local subnets that the default assembler has not advertised. In some cases, you may want to disable dynamic routing on the remote device.
- The sending device excludes a specific address or subnet, either through the exclusion list (see below) or through the source/destination filter (refer to [“Filtering Data Reduction by Source and Destination” on page 100](#)).

Figure 5-10 shows a simple example of a remote site with one outbound connection to the corporate network. If P1 is the default assembler for P2, all traffic that uses the default route on P2 is reduced and sent to P1.



**Figure 5-10** Setting a Default Assembler

To disable data reduction for traffic sent to subnet S4, you can add S4 to the exclusion list on Peribit B. You can specify up to six default assemblers. If you specify more than one default assembler, the current load balancing policies are applied (refer to [“Configuring Load Balancing Policies” on page 133](#)).



**NOTE:** Default assemblers can be used only in live operation (not in Profile Mode). Be sure you understand which Peribit devices will use a default assembler, and which local routes the default assembler supports.

To define default assemblers:

1. Log in to the device where you want to specify default assemblers.
2. Click **REDUCTION** in the menu frame, click **ADVANCED** in the left-hand navigation frame, and then click **Default Assemblers**.

**Peribit-SR**

SETUP REDUCTION QOS ACCELERATION MONITOR ADMIN HELP Logged in as: admin SAVE LOGOUT

**Reduction**

BASIC

- Endpoints
- Reduction Subnets
- Application Filter

ADVANCED

- Remote Routes
- Load Balancing
- Default Assemblers**
- Preferred Assemblers
- Tunnel Mode

**Default Assemblers**

If traffic is destined for a subnet that is NOT included in the Remote Routes list, it is normally passed through without reduction. However, if a Default Assembler (a Peribit device) is entered below, this traffic will be reduced and routed to the Default Assembler.

If a Default Assembler is entered, certain traffic can be excluded from this feature by entering the destination IP address/subnet mask in the Exclude List below.

**Default Assemblers**

Enter IP addresses of Peribit devices, one per line. A maximum of 6 Default Assemblers may be entered. If more than one Default Assembler is entered, then the Load Balancing policy will be applied. If Load Balancing is set to "Off", then the precedence of the Default Assemblers will be based on their order in the list.

**Exclude List**

Enter addresses/subnets, one per line. For an individual host, enter the IP address only. For a subnet, enter the IP address and subnet mask separated by a slash (/).  
Examples:  
123.123.123.123  
123.123.123.1/255.255.255.0

Submit Reset

**Figure 5-11 Creating a Default Assembler List**

3. In the **Default Assemblers** box, enter the IP address of up to six default assemblers (one per line). If load balancing is disabled, the precedence of the default assemblers is based on their order in the list.
4. In the **Exclude List** box, enter an IP address or an IP address and subnet mask separated by a slash (/) for the hosts or subnets whose traffic is not reduced before being sent to the default assembler. If you enter an address or subnet that belongs to another Peribit device, the exclusion is ignored.
5. Click **Submit** to activate the changes, or click **Reset** to discard them.



6. Log in to each default assembler you specified and do the following:
  - If dynamic routing is not used, add a static route to each Peribit device in the community. The gateway for each route is the default gateway on the Remote interface (the WAN side). To add a static route, refer to [“Configuring Local Routes” on page 67](#).
  - Change the default gateway to the IP address of the next-hop router on the Local interface (the LAN side). To change the default gateway, refer to [“Configuring Device Address and Contact Information” on page 59](#).
7. To retain your changes when the device is restarted, click **SAVE** in the menu frame.

## Defining Preferred Assemblers

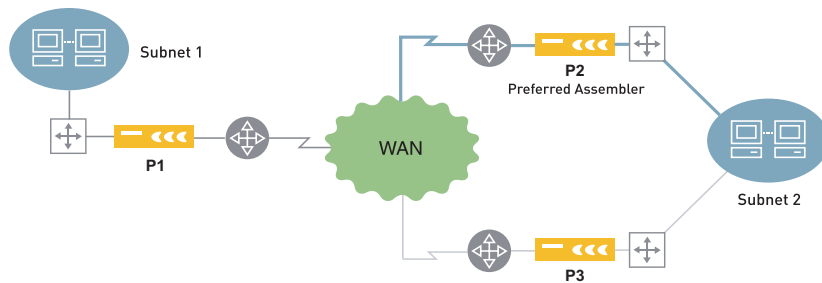
If two or more devices in the same Peribit community have equal cost paths to the same subnet, you can control the selected path by specifying a preferred assembler. Alternatively, you can use load balancing to vary the selected path, as described in [“Configuring Load Balancing Policies” on page 133](#). If neither load balancing nor preferred assemblers are used, the path selection is arbitrary.

---

**NOTE:** Preferred assemblers are ignored if load balancing is enabled.

---

For example, in Figure 5-12, data from Subnet 1 has two network paths to Subnet 2. If the Peribit device P1 designates P2 as a preferred assembler, all reduced data destined to Subnet 2 is sent to P2. If P2 is unavailable, P3 is used.



**Figure 5-12** Designating a Preferred Assembler

Note that a preferred assembler is used even for routes that have a lower cost on an alternate Peribit device.

To create a list of preferred assemblers:

1. Click **REDUCTION** in the menu frame, click **ADVANCED** in the left-hand navigation frame, and then click **Preferred Assemblers**.

**Peribit-SR**

SETUP REDUCTION QOS ACCELERATION MONITOR ADMIN HELP Logged in as: admin SAVE LOGOUT

**Reduction**

BASIC

- Endpoints
- Reduction Subnets
- Application Filter

ADVANCED

- Remote Routes
- Load Balancing
- Default Assemblers
- Preferred Assemblers**
- Tunnel Mode

**Preferred Assemblers**

If more than one reduction tunnel exists for a given subnet and no other policies apply, traffic will be routed to one of the tunnels on an arbitrary basis. However, you can give precedence to a particular tunnel by entering the associated assembler in the list of Preferred Assemblers below.

If the Load Balancing policy is set to anything other than "Off", then it will override this policy.

**Preferred Assemblers**

Enter IP addresses of Peribit devices, one per line. If more than one Preferred Assembler is contending for the same traffic, then precedence will be based on the order in which they appear in the list.

Submit Reset

**Figure 5-13 Defining Preferred Assemblers**

2. Enter the IP address of a remote preferred assembler. You can specify up to 80 preferred assemblers (one per line).
3. Click **Submit** to activate the changes, or click **Reset** to discard them.
4. To retain your changes when the device is restarted, click **SAVE** in the menu frame.

## Configuring Tunnel Mode Settings

The devices in a Peribit community use reduction tunnels to send reduced data to each other. By default, the reduced data is transmitted as a single flow of data packets between the source and destination Peribit devices (port 3577).

Two other tunnel modes are available:

- **Multi-flow emulation.** Arbitrarily assigns source port numbers to each traffic flow so that routers using Weighted Fair Queueing (WFQ) can distribute WAN bandwidth among the various flows.
- **Application visibility.** Preserves the source and destination ports of all packets so that performance monitoring tools can identify the various devices responsible for the traffic in the reduction tunnel. The tunneled traffic is enclosed in UDP “meta” packets, so verify that your tools are configured to monitor UDP traffic.

---

**NOTE:** The multi-flow emulation and application visibility options reduce packet aggregation, thus affecting the reduction in the number of packets.

---

A third “ipcomp” option reduces the size of each meta-packet header by six bytes, which may improve reduction in environments that have many small packets with relatively low compression ratios. To use this option, enter the CLI command “configure reduction set tunnelmode ipcomp” (refer to “[Tunnel mode](#)” on page 298).

To configure the tunnel mode settings.

1. Click **REDUCTION** in the menu frame, click **ADVANCED** in the left-hand navigation frame, and then click **Tunnel Mode**.

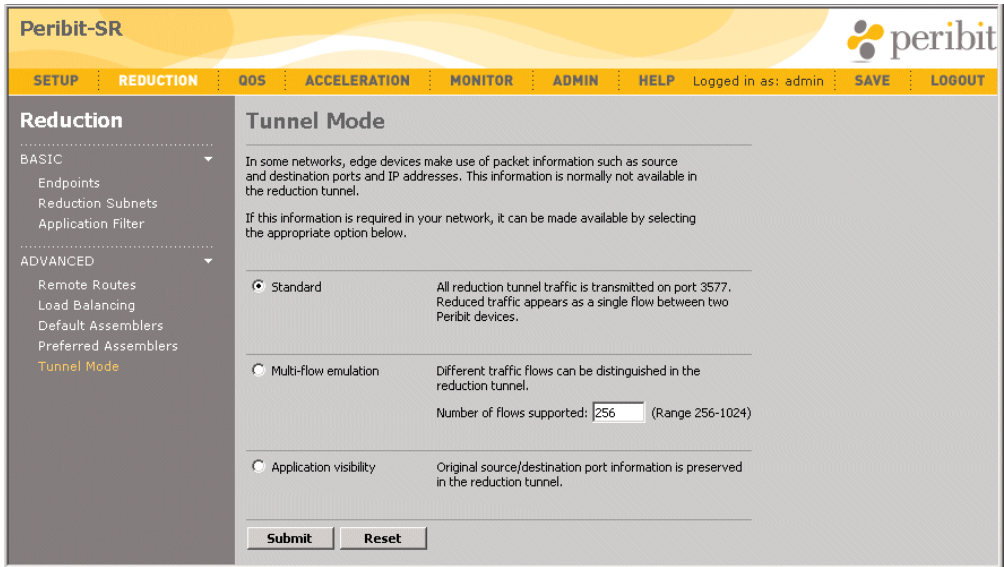


Figure 5-14 Configuring Tunnel Mode Settings

2. Select one of the following tunnel modes:.

Standard	No requirement to support router bandwidth management or performance monitoring tools. Provides maximum data reduction.
Multi-flow emulation	Allows routers using WFQ to manage WAN bandwidth among the various flows in the tunneled traffic. Enter the maximum number of flows expected (256 through 1024) to help allocate resources efficiently (not a hard limit).
Application visibility	Allows performance monitoring tools to identify the devices responsible for the tunneled traffic.

3. Click **Submit** to activate the changes, or click **Reset** to discard them.
4. To retain your changes when the device is restarted, click **SAVE** in the menu frame.

### Configuring Pre-Synchronization for Network Sequence Mirroring

On Sequence Mirror devices where Network Sequence Mirroring (NSM) is enabled, “pre-synchronization” can be used to improve user response times and reduction rates for large files, such as database files and software updates. During pre-synchronization, the repeated patterns in the files are added to the reduction dictionaries of the selected devices, so that reduction occurs when the first user requests the files.

With standard tools such as Perl and cron, you can put the pre-sync CLI commands in a script and schedule pre-synchronization to occur automatically during off-peak hours (refer to the CLI commands in [“Pre-Synchronization” on page 297](#)).

Pre-synchronization has the following requirements:

- The files must be loaded on an FTP server.
- The Sequence Mirror where you configure pre-synchronization must have the FTP server on its LAN side so that it can reduce all the traffic sent from the FTP server to the remote SM devices.
- NSM must be enabled between Sequence Mirror devices, refer to [“Configuring Network Sequence Mirroring” on page 128](#).
- NSM must be enabled for the application that users will access to retrieve the files (refer to [“Reducing and Monitoring Applications” on page 130](#)).

To configure pre-synchronization for NSM:

1. Log in to a Sequence Mirror that has the FTP server on its LAN side.

---

**NOTE:** Do not configure pre-synchronization on an off-path device that uses RIP for packet interception. Traffic from the FTP server will be routed directly to the remote SMs without being reduced.

---

2. Click **REDUCTION** in the menu frame, click **ADVANCED** in the left-hand navigation frame, and then click **Pre-Sync**.

**Peribit-SM**

SETUP REDUCTION QOS ACCELERATION MONITOR ADMIN HELP Logged in as: admin SAVE LOGOUT

**Reduction**

BASIC

- Endpoints
- Reduction Subnets
- Network Sequence Mirror
- Application Filter

ADVANCED

- Remote Routes
- Load Balancing
- Default Assemblers
- Preferred Assemblers
- Tunnel Mode
- Pre-Sync**

**Pre-Sync**

This page allows you to increase the efficiency with which the data dictionary is created in NSM-capable Peribit devices. This is done by sending large files to the checked Peribit devices before they are requested by a client.

Enter file pathnames for FTP server's below (one per line). Then check the Peribit devices from the list below. When you click "Go", the file(s) will be sent to each of the Peribit devices in turn.

FTP file pathnames are of the form  
`ftp://host:port:user:password/path` where some or all of the parts  
`:user:password`, `:password`, `:port` and `/path` may be excluded.

File Pathname

IP address Device name

☐ 192.168.53.2 53/2-SR55

Select All Clear

Go

**Figure 5-15** Configuring Pre-Synchronization for Network Sequence Mirroring

3. Specify the FTP server location of each file (one file per line). The general format is:

```
ftp://host:port:user:password/path
```

Where:

- **host**. FTP server name or IP address.
  - **:port**. FTP port number. Omit if port 21 is used.
  - **:user:password**. FTP user name and password. Omit if server allows anonymous access.
  - **/path**. File location on the server.
4. Select the check box next to the IP address of each Sequence Mirror device where you want to send the specified file(s). To select all devices, click **Select All**.

---

**NOTE:** The FTP server must be reachable from each remote device.

---

5. Click **Go** to send the files to the selected devices.

To view the results of the last 50 pre-synchronization tasks, enter the following CLI command:

```
show reduction network-sequence-mirroring
```

## Configuring Tunnel Switching in Hierarchical Deployments

Each Peribit device can perform data reduction (form reduction tunnels) for a varying number of remote Peribit devices, depending on the device type. For example, an SR-20 can support five reduction tunnels. Tunnel switching allows each device to reduce data for every other Peribit device in the network, without having to form a reduction tunnel with each remote device.

To optimize performance, Peribit devices can be deployed hierarchically in either of the following ways:

- Assign devices to separate communities (only devices in the same community can reduce and assemble data for each other)
- Apply hub and spoke topology designations to selected devices in the same community (by default, spoke devices reduce and assemble data only for hub devices)

Tunnel switching can be used to send compressed traffic between devices in separate communities or between spoke devices associated with the same hub or different hubs.

If outbound QoS is enabled, bandwidth management is applied to tunnel-switched packets in the normal manner.

---

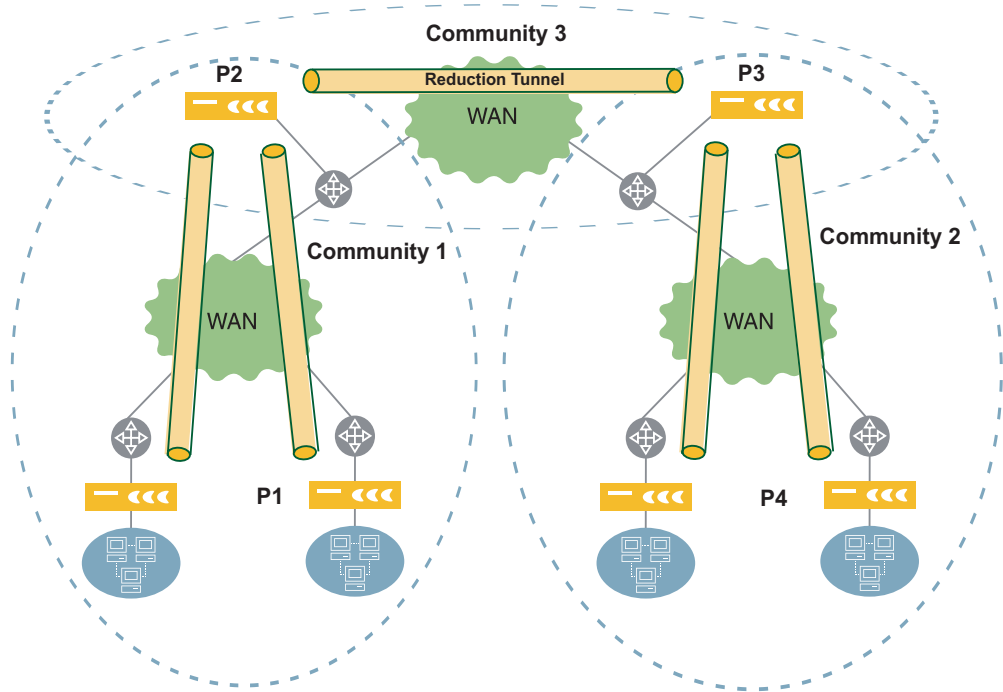
**NOTE:** Inbound QoS applies only to traffic received on the Remote interface. When both the Local and Remote interfaces are connected to a WAN router, inbound QoS has no effect on incoming WAN traffic on the Local interface.

---

### Tunnel Switching Between Communities

You can organize Peribit devices into hierarchical communities by assigning selected devices to multiple communities. On these common devices, which act as default assemblers for traffic leaving the community, you must enable tunnel switching to reduce the traffic for the next device in the path.

In Figure 5-16, tunnel switching is enabled on P2 and P3 in Community 3. These are the common devices that convey reduced traffic between Community 1 and Community 2.



**Figure 5-16 Example of Tunnel Switching Between Communities**

When P1 in Figure 5-16 encounters traffic destined for a subnet advertised by P4, the following processing occurs:

1. P1 cannot match the destination to an advertised reduction subnet (P4 is in a separate community), so P1 reduces the traffic and sends it to the default assembler (P2).
2. P2 assembles the traffic from P1, matches the destination to a reduction subnet advertised by P3, recompresses the traffic, and sends it to P3. If tunnel switching is disabled on P2, the traffic is sent to P3 uncompressed.
3. P3 assembles the reduced traffic from P2, matches the destination to a reduction subnet advertised by P4, recompresses the traffic, and sends it to P4. If tunnel switching is disabled on P3, the traffic is sent to P4 uncompressed. If the traffic from P2 is uncompressed, the traffic is compressed and sent to P4 (no recompression).
4. Traffic from P4 to P1 follows the reverse path, with P3 serving as the default assembler for P4 (and the other devices in Community 2).

Note that Figure 5-16 can be simplified by omitting Community 3 and assigning P2 and P3 to both Community 1 and 2. In that way, P2 can send recompressed traffic directly to P4, without requiring assembly and recompression on P3.

## Procedure for Configuring Tunnel Switching Between Communities

To configure tunnel switching between communities:

1. Identify the common devices in each community that convey reduced traffic between communities.
2. On each of the other devices in a community, designate the common device as the default assembler (refer to [“Defining Default Assemblers” on page 135](#)). Alternatively, on each common device, you can manually define static routes for the external subnets that you want to advertise to the other devices in the community.
3. On the common devices, enable tunnel switching and disable LAN/WAN checking (refer to [“Configure Reduction Command” on page 293](#)). For off-path devices, LAN/WAN checking is disabled by default.
4. If necessary, enable WAN reduction subnets on the common devices (refer to [“Configure Reduction Subnets Command” on page 301](#)). For example, in Figure 5-16, if the other devices in Community 1 are on the Remote (WAN) side of P2, WAN reduction subnets must be enabled on P2 so that the appropriate subnets can be advertised to P3. In this case, since P2 is an off-path device, WAN reduction subnets are enabled by default.
5. If necessary, define static routes between the common devices (refer to [“Adding Static Routes” on page 69](#)).

## Tunnel Switching Between Hub and Spoke Devices

In the same community, you can organize Peribit devices into multiple sets of hubs and spokes, and then use tunnel switching to send reduced traffic between any two spoke devices. By default, spoke devices reduce and assemble data only for the hubs. You can further restrict each spoke to work only with a specific hub.

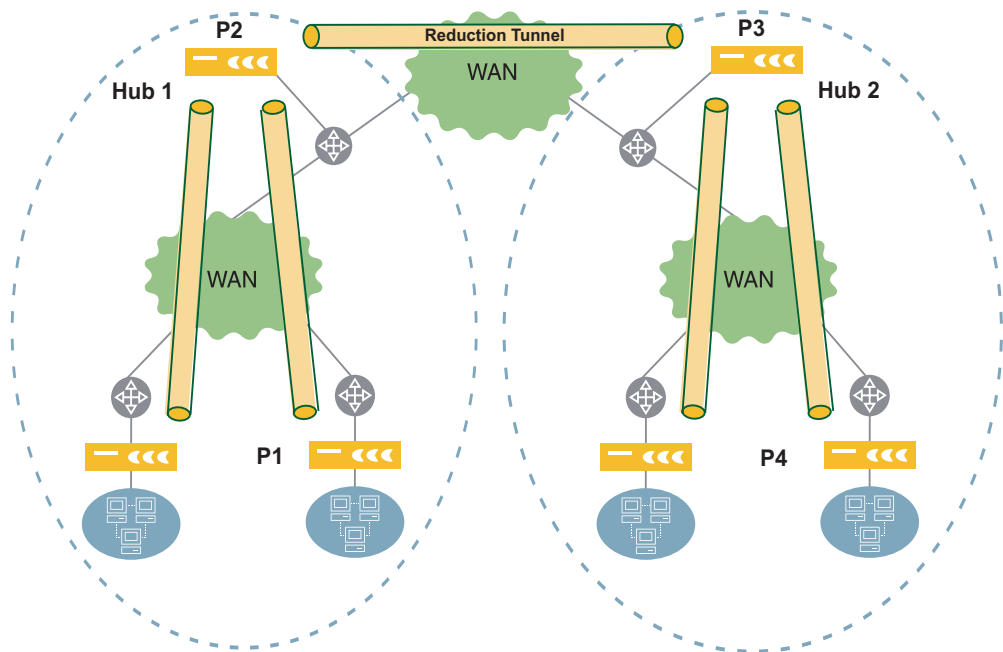
Tunnel switching for hub and spoke topologies works in the same manner as for hierarchical communities. Figure 5-17 is very similar to Figure 5-16, except that all the devices are in the same community, and tunnel switching is enabled on the hub devices (P2 and P3).

Note that tunnel switching can be used between spokes on the same hub, such as when you add new spokes to a hub and some existing spokes cannot support any additional direct tunnels.

---

**NOTE:** When the maximum range of devices is selected for a hub (range 5), the hub conserves memory by not assembling data from the spokes—only data sent from the hub to the spokes is reduced. In this case, tunnel switching cannot be enabled on the hub.

---



**Figure 5-17 Example of Tunnel Switching Between Spoke Devices**

To configure tunnel switching between spoke devices:

1. Identify the hub devices that convey reduced traffic between spokes.
2. On each of the spoke devices, designate the hub device as the default assembler (refer to [“Defining Default Assemblers” on page 135](#)). Alternatively, on each hub device, you can manually define static routes for the external subnets that you want to advertise to the other devices in the community.
3. On the hub devices, enable tunnel switching and disable LAN/WAN checking (refer to [“Configure Reduction Command” on page 293](#)).
4. If necessary, enable WAN reduction subnets on the hub devices (refer to [“Configure Reduction Subnets Command” on page 301](#)). For example, in Figure 5-16, if the spoke devices for Hub 1 are on the Remote (WAN) side of P2, WAN reduction subnets must be enabled on P2 so that the appropriate subnets can be advertised to P3.
5. If necessary, define static routes between the hub devices (refer to [“Adding Static Routes” on page 69](#)).



## Chapter 6 Applying Quality of Service (QoS) Policies

---

The following sections describe how Peribit devices use Quality of Service (QoS) policies to allocate WAN bandwidth to your network applications:

- [“Using Outbound QoS to Enhance Performance” in the next section](#)
- [“Understanding Outbound Bandwidth Management” on page 146](#)
- [“Configuring Outbound QoS Policies” on page 153](#)
- [“Configuring Inbound QoS Policies” on page 173](#)

### Using Outbound QoS to Enhance Performance

Outbound QoS provides two key benefits:

- **Basic bandwidth allocation.** Data reduction performance is automatically optimized based on the local WAN speed, and is particularly effective for low-speed links. Only minimal QoS settings are required.
- **Advanced bandwidth allocation.** Application performance across the WAN is optimized by specifying guaranteed bandwidths for critical applications.

---

**NOTE:** Basic bandwidth allocation is highly recommended to optimize performance on all Peribit devices.

---

The advanced QoS policies let you guarantee bandwidths by traffic class, and define templates of QoS policies that can be easily applied to multiple endpoints. ToS and DSCP markings can be used for QoS scheduling and/or preserved for use by devices upstream from the Peribit device. Special bandwidth policies can be configured to handle “oversubscribed” WANs where the local WAN bandwidth is less than the sum of the remote endpoint bandwidths.

To enable basic bandwidth allocation:

1. Specify the local “aggregate” WAN speed, as described in [“Defining Outbound QoS Endpoints” on page 166](#). Selecting each remote Peribit device and specifying its WAN circuit speed is also recommended.

For guidance on adjusting the WAN speeds to account for router overhead, refer to [“WAN Circuit Speeds and Router Overhead” on page 148](#).

2. Start outbound QoS using Weighted Fair Queuing (WFQ) or Weighted Strict Priority (WSP), as described in [“Starting and Stopping Outbound QoS” on page 172](#). Unless you need strict priority treatment for traffic classes, WFQ is recommended.

## Understanding Outbound Bandwidth Management

If all WAN traffic goes through the Peribit device, then outbound QoS policies can control how the entire WAN bandwidth is allocated to all contending applications, regardless of whether traffic is being reduced. Outbound bandwidth management lets you:

- Guarantee a minimum bandwidth for your most critical applications.
- Set priorities to determine how the “excess” bandwidth is allocated. The excess bandwidth is the unguaranteed bandwidth, plus the guaranteed bandwidth that is not currently in use.
- Set maximum bandwidths to limit (or drop) low-priority traffic.
- Change the ToS/DSCP values on selected traffic for use by other QoS devices in the network.

A Setup Wizard is provided to simplify the creation of QoS templates that specify the priorities and bandwidths by traffic class. Templates created by the wizard can be modified manually.

---

**NOTE:** Outbound bandwidth management is not effective for an off-path Peribit device unless all outbound WAN traffic is routed through the device.

---

The following topics provide an overview of outbound QoS:

- [“Traffic Classes and Bandwidths” on page 147](#)
- [“QoS Templates and Endpoints” on page 147](#)
- [“WAN Circuit Speeds and Router Overhead” on page 148](#)
- [“Dedicated and Oversubscribed WANs” on page 149](#)
- [“Direct Setup Versus Wizard Configuration Results” on page 150](#)
- [“Class Priorities and Excess Bandwidth Allocation” on page 152](#)
- [“ToS/DSCP Prioritization” on page 153](#)
- [“Unadvertised Subnets” on page 153](#)
- [“Summary of Key Terms” on page 175](#)

## Traffic Classes and Bandwidths

Priorities and bandwidths are specified by traffic class, and each class can have one or more applications. Initially, all applications belong to the Default class. To guarantee a minimum bandwidth for one application, assign the application to its own class, and then specify the guaranteed bandwidth. Figure 6-1 shows the default settings for the standard traffic classes created by the Setup Wizard. You can have up to 16 traffic classes.

Traffic Class	Priority	Guaranteed Bandwidth	Maximum Bandwidth
Default	0 (Lowest)	0.00 %	100.00 %
Business Critical	0 (Lowest)	40.00 %	100.00 %
Business Standard	0 (Lowest)	20.00 %	100.00 %
Low-Latency	7 (Highest)	20.00 %	100.00 %
Prohibited	0 (Lowest)	0.00 %	0.00 %

**Figure 6-1** Predefined Traffic Classes

You can guarantee up to 80% of the total bandwidth across all classes. Traffic is dropped when the maximum bandwidth is exceeded or when the guaranteed bandwidth is exceeded while the circuit is fully utilized, such as during a burst of high-priority traffic. The 20% of unguaranteed bandwidth ensures that bandwidth is always available for local system resources, such as SNMP updates and management traffic.

The priority value (0 to 7) assigned to each traffic class is used to allocate the excess bandwidth to each class as the traffic load fluctuates (refer to [“Class Priorities and Excess Bandwidth Allocation”](#) on page 152).

Note that the Default class, which cannot be deleted, includes all undefined traffic. You must create an application definition for any traffic whose bandwidth you want to manage separately (refer to [“Managing Applications”](#) on page 90).

## QoS Templates and Endpoints

The priorities and bandwidths defined for each traffic class constitute a template. On each device, you can manage the outbound bandwidth by assigning a template to each remote Peribit device (endpoint). You can create a different template for each endpoint, or create a single template and customize it for specific endpoints.

---

**NOTE:** QoS templates let you vary the priorities and bandwidths for each traffic class, but all templates (and all endpoints) have the same traffic classes, and the same applications in each class.

---

The Setup Wizard creates two identical templates and assigns them to the selected endpoints:

- **Wizard-PrimeTime.** Applies to prime time hours, or to all hours if prime time is not defined. To specify the prime time, refer to [“Defining the Prime Time”](#) on page 103.
- **Wizard-NonPrimeTime.** Applies to non-prime time hours (if prime time hours are defined), and can be modified to allocate more bandwidth to applications that run during off-peak hours, such as database backups. You can view the bandwidth reports for prime time or non-prime time hours (refer to [“Outbound Bandwidth Statistics”](#) on page 214).

You can also assign a template to the predefined “Other Traffic” endpoint to manage outbound traffic that does not have a remote Peribit device or for which the remote device is not enabled for outbound QoS. In addition, to more closely manage traffic that is not sent to a Peribit device, you can create virtual endpoints for specific remote subnets.

## WAN Circuit Speeds and Router Overhead

On each Peribit device that supports outbound QoS, you must specify the following WAN circuit speeds:

- **Aggregate WAN speed.** The sum of the WAN circuit speeds on the adjacent router.
- **Endpoint circuit speeds.** The WAN circuit speed associated with each remote Peribit device for which you want to manage the outbound bandwidth.

---

**NOTE:** To effectively manage the WAN bandwidth, the Peribit device must be the sole source of the WAN traffic.

---

All WAN circuit speeds specified for outbound QoS must be set slightly lower than the WAN router’s full interface speed to allow for router overhead (Frame Relay LMI updates, CDP, SNMP, routing updates, and so on). Setting the bandwidth about 2% below the link speed should work well in most cases. However, the router overhead is highly variable, and depends on the network configuration.

The following table provides some recommended adjustments to the WAN interface speeds. Note that failure to account for router overhead will effectively shift bandwidth management to the router, and may cause the router to drop traffic.

**Table 6-1 Recommended WAN Circuit Speed Adjustments**

WAN Interface	Recommended QoS Speed	Description
Frame Relay	CIR minus 2%	Reduce the Committed Information Rate (CIR) by 2%. Higher speeds, up to the Peak Information Rate (PIR), may be acceptable, depending on the traffic load and whether "discard eligible" traffic is actually discarded. If the Peribit device exceeds the CIR, and discard eligible traffic is dropped, the QoS behavior may be unpredictable.
1.544 Mbps (T1)	1500 Kbps	The T1 line rate is 1.544 Mbps, but the data rate is 1.536 Mbps. The 8 Kbps difference is used for framing and encapsulation. Subtracting 2% from 1.536 yields about 1.5 Mbps.
512 Kbps (Fractional T1)	500 Kbps	Use one third of the T1 setting.
64 Kbps	60 Kbps	On low-speed links, router overhead may take up a greater percentage of the WAN link speed. Using 60 Kbps assumes that 6% of the link is used for router control traffic.

## Dedicated and Oversubscribed WANs

In point-to-multi-point configurations, the guaranteed bandwidth percentages assigned to each traffic class may have to be adjusted, depending on whether the WAN is “dedicated” or “oversubscribed”:

- **Dedicated.** The aggregate WAN speed (the sum of the WAN circuit speeds on the adjacent router) is equal to or greater than the sum of the remote WAN speeds. In this case, no adjustments to the bandwidth percentages are needed. In Figure 6-2, the WAN speed for Peribit device P1 (1.5 Mbps) equals the total speed of the three remote endpoints—P2, P3, and Other Traffic.

If P1 specifies a guaranteed bandwidth of 60% for all traffic classes for each endpoint, the guaranteed capacity is 300 Kbps for P2, P3, and Other Traffic (.6 x 500 Kbps).

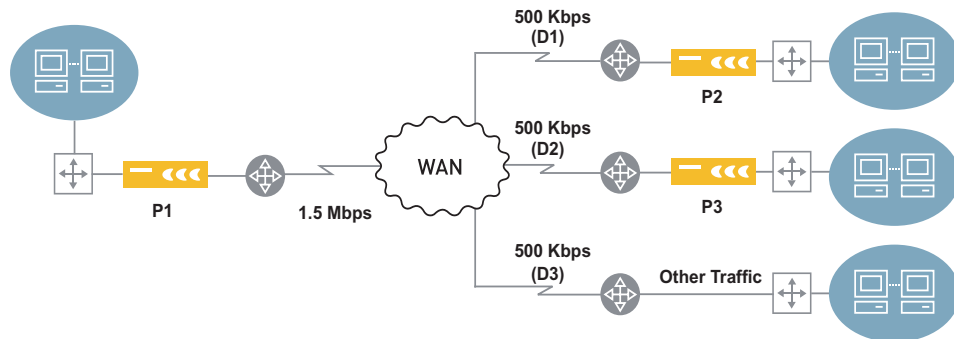


Figure 6-2 Dedicated WAN

- **Oversubscribed.** The aggregate WAN speed is less than the sum of the remote WAN speeds. In this case, the total guaranteed bandwidth across all classes *and endpoints*, cannot exceed 80% of the aggregate WAN speed. In Figure 6-3, the WAN is oversubscribed from the perspective of Peribit device P1.

On P1, if you manually specify a guaranteed bandwidth of 60% for all traffic classes for each endpoint, an error occurs because the sum of the guaranteed bandwidths for all endpoints ( $300 + 900 + 36 = 1236$  Kbps) exceeds 80% of the aggregate WAN speed (1200 Kbps). However, the Setup Wizard lets you enter guarantees of up to 80%, and then automatically adjusts the guaranteed bandwidths for each traffic class to proportionately distribute the total guaranteed bandwidth.

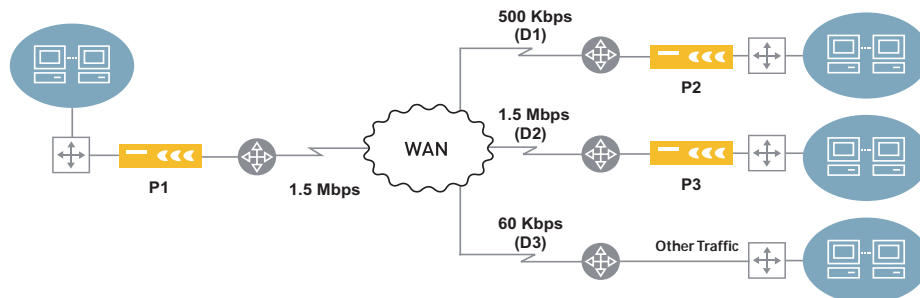


Figure 6-3 Oversubscribed WAN

## Direct Setup Versus Wizard Configuration Results

For a dedicated WAN, if you apply the same bandwidths and priorities to each endpoint, the Setup Wizard produces the same results as entering the QoS settings directly. However, for an oversubscribed WAN, the Wizard adjusts the template percentages so that the guaranteed portion of the aggregate WAN speed is distributed fairly across all classes and endpoints.

For example, Table 6-2 shows the Wizard and direct setup results when P1 in Figure 6-3 is configured with two traffic classes and the same guaranteed bandwidths for each endpoint.

**Table 6-2 Direct Setup Versus Wizard Results for a Simple Oversubscribed WAN for Peribit P1**

Endpoint	Remote Circuit Speed	Traffic Class	Class Guaranteed Percentage	Direct Guaranteed Percentage	Direct Guaranteed Rate	Wizard Guaranteed Percentage	Wizard Guaranteed Rate
D1	500 Kbps	Default	15%	15%	75 Kbps	10.92%	54 Kbps
		Business	40%	40%	200 Kbps	29.12%	145 Kbps
D2	1500 Kbps	Default	15%	15%	225 Kbps	10.92%	163 Kbps
		Business	40%	40%	600 Kbps	29.12%	436 Kbps
D3	60 Kbps	Default	15%	15%	9 Kbps	10.92%	6 Kbps
		Business	40%	40%	24 Kbps	29.12%	17 Kbps
<b>Totals</b>	<b>2060 Kbps</b>		<b>55%</b>	<b>55%</b>	<b>1133 Kbps</b>	<b>40.04%</b>	<b>821 Kbps</b>

### Direct Setup Results

If you enter the QoS settings directly, the **Direct Guaranteed Rate** column in Table 6-2 shows the guaranteed bandwidth in Kbps allocated to each traffic class on each endpoint. The guaranteed rate is calculated as follows:

$$(\text{Remote Circuit Speed}) * (\text{Class Guaranteed Percentage})$$

For example, the guaranteed rate for the Default class at endpoint D1 is:

$$(500) * (.15) = 75 \text{ Kbps}$$

Since the total guaranteed bandwidth (1133 Kbps) does not exceed 80% of the P1 aggregate WAN speed (.8 \* 1500 = 1200 Kbps), you can enter all the QoS settings directly without having to adjust the guaranteed percentages. Figure 6-4 shows the “Oversubscribed” template specifying the 15% and 40% guarantees, and Figure 6-5 shows the guaranteed bandwidths in Kbps displayed on the Outbound QoS Overview page when the template is applied to each endpoint.

Template Name		Bandwidth Limit (%)	
Traffic Class	Priority	Guaranteed	Maximum
Default	0 (Lowest)	15.00	100.00
Business	0 (Lowest)	40.00	100.00

**Figure 6-4 Oversubscribed Template for Peribit P1**

Endpoint		Template	Circuit Speed (Kbps)	Traffic Classes		Total Guaranteed Bandwidth
				Default	Business	
Other traffic	<a href="#">EDIT</a>	Oversubscribed	60	9	24	33
192.168.53.5	<a href="#">EDIT</a>	Oversubscribed	500	75	200	275
192.168.52.22	<a href="#">EDIT</a>	Oversubscribed	1500	225	600	825
<b>Total</b>				<b>309</b>	<b>824</b>	<b>1133</b>

**Figure 6-5 Direct Setup Results on the Outbound QoS Overview Page for Peribit P1**

### Wizard Results

If you use the Setup Wizard, the 15% and 40% guarantees entered in the Wizard are adjusted in the resulting Wizard template, as shown in the **Wizard Guaranteed Percentage** column in Table 6-2. The Wizard template guarantees are calculated as follows:

(Class Guaranteed Percentage) \* (Aggregate WAN Speed/Total Remote Circuit Speeds)

For example, the 15% guarantee entered for the Default class becomes:

$$(.15) * (1500/2060) = .1092 = 10.92\%$$

The **Wizard Guaranteed Rate** column shows the adjusted guaranteed rates for each class on each endpoint. For example, the guaranteed rate for the Default class at endpoint D1 is:

$$(500) * (.1092) = 54 \text{ Kbps}$$

Note that the Wizard total guaranteed bandwidth (821 Kbps) is 55% (15% + 40%) of the aggregate WAN speed (1500 Kbps) for SR1. Figure 6-6 shows the guaranteed bandwidths in Kbps generated by the Setup Wizard and displayed on the Outbound QoS Overview page.

Endpoint		Template	Circuit Speed (Kbps)	Traffic Classes		Total Guaranteed Bandwidth
				Default	Business	
Other traffic	<a href="#">EDIT</a>	Wizard-PrimeTime	60	6	17	23
192.168.53.5	<a href="#">EDIT</a>	Wizard-PrimeTime	500	54	145	199
192.168.52.22	<a href="#">EDIT</a>	Wizard-PrimeTime	1500	163	436	599
<b>Total</b>				<b>223</b>	<b>598</b>	<b>821</b>

**Figure 6-6 Wizard Results on the Outbound QoS Overview Page for Peribit P1**

The Wizard adjusts the bandwidths for oversubscribed WANs only when there are multiple remote endpoints. For example, in Figure 6-3 on page 149, the WAN is oversubscribed from the perspective of P2, but the bandwidths defined on P2 would not be adjusted because P1 is the only remote endpoint.

## Class Priorities and Excess Bandwidth Allocation

Excess bandwidth is the unguaranteed bandwidth, plus the guaranteed bandwidth that is not currently in use. As the traffic load varies, the excess bandwidth is allocated dynamically to each traffic class based on the class priority (0 to 7) and the selected queuing model. The two queuing models are Weighted Fair Queuing and Weighted Strict Priority (the selected model applies to all classes).

---

**NOTE:** The priorities assigned to each traffic class are used only by the Peribit device, and are not related to ToS priorities.

---

- **Weighted Strict Priority (WSP).** Queues are created for each priority, and the excess bandwidth is allocated by processing the queues based only on priority. That is, the class with the highest priority gets all the excess bandwidth it needs before any excess bandwidth is allocated to the class with the next highest priority.
- **Weighted Fair Queuing (WFQ).** Queues are created for each traffic class, and the excess bandwidth is allocated as described in Table 6-3. The allocation depends on whether the WAN is dedicated or oversubscribed.

**Table 6-3 WFQ Allocation of Excess Bandwidth**

WAN Type	Excess Bandwidth Allocation
Dedicated	<p>To calculate the percentage of excess bandwidth allocated to a traffic class for a specific remote endpoint (since priorities start with zero, they must be incremented by one for this calculation):</p> $(\text{Class Priority} + 1) / (\text{Sum of active class priorities} + 1 \text{ for each class})$ <p>For example, for the five standard classes where four classes have priority zero and the Low Latency class has priority 7, the Low Latency class receives the following minimum percentage of excess bandwidth:</p> $\text{Excess\%} = 8 / 12 = 66\%$ <p>Note that if only one class has traffic, then that class receives 100% of the bandwidth.</p> <p>To calculate the minimum excess bandwidth for a class in Kbps:</p> $(\text{Excess\%})(\text{Remote WAN speed} - \text{Total class guarantee in Kbps})$ <p>For example, if the Excess% is 66%, the remote WAN speed is 500 Kbps, and the guaranteed bandwidth for all classes is 80%, the minimum excess bandwidth is:</p> $(.66)(500 - 80) = 66 \text{ Kbps}$
Oversubscribed	<p>The excess bandwidth percentage for a class on a specific endpoint is calculated in the same manner as a dedicated WAN, except that the priorities must be totaled across all remote endpoints.</p> <p>For example, if you have three endpoints using the same classes and priorities as in the dedicated example, the minimum excess bandwidth for the Low Latency class is:</p> $\text{Excess\%} = 8 / (12 + 12 + 12) = 22\%$ <p>To calculate the minimum excess bandwidth for a class in Kbps:</p> $(\text{Excess\%})(\text{Aggregate WAN speed} - \text{All endpoint class guarantees in Kbps})$ <p>Note that you must calculate the sum of the guaranteed bandwidths for each class on each remote endpoint. For the example in Table 6-2 on page 150, the sum of the bandwidths is 1133 Kbps using direct setup or 821 Kbps using the Wizard.</p>



## ToS/DSCP Prioritization

You can use the ToS/DSCP values in the packet headers to manage the outbound bandwidth. Queues are created for the ToS/DSCP values, and the higher priority queues are processed first. This method is the most likely to cause low-priority traffic to be dropped because the QoS templates are ignored (no guaranteed or maximum bandwidths).

Note that you can also set the ToS/DSCP values by traffic class for use by other devices in your network, regardless of whether ToS/DSCP prioritization is used. You can also preserve the incoming ToS/DSCP values in the Peribit “meta-packets,” so that each meta-packet encapsulates only packets that have the same ToS/DSCP value. This allows other QoS devices in the path to manage the meta-packets in the same manner as the individual packets. For more information about setting ToS/DSCP values, refer to [“Changing Outbound ToS/DSCP Values” on page 170](#).

## Unadvertised Subnets

All subnets that are not advertised by a Peribit device will be managed by the QoS settings for the “Other traffic” endpoint. To ensure that the appropriate QoS policies are applied to all the traffic, each Peribit device should advertise all the subnets it can access. The source/destination filter can be used to prevent data reduction for specific destinations, as needed (refer to [“Filtering Data Reduction by Source and Destination” on page 100](#)).

By default, each Peribit device dynamically adjusts its advertised subnets to exclude any hosts or gateways that become unreachable. Traffic to these “carved out” addresses is also attributed to the “Other traffic” endpoint.

## Configuring Outbound QoS Policies

This section describes how to configure outbound QoS policies for bandwidth management, and covers the following topics:

- [“Procedure for Configuring Outbound QoS Policies” on page 154](#)
- [“Using the Outbound QoS Setup Wizard” on page 155](#)
- [“Defining Outbound QoS Settings by Endpoint” on page 161](#)
- [“Defining Traffic Classes” on page 163](#)
- [“Defining Outbound QoS Templates” on page 164](#)
- [“Defining Outbound QoS Endpoints” on page 166](#)
- [“Changing Outbound ToS/DSCP Values” on page 170](#)
- [“Starting and Stopping Outbound QoS” on page 172](#)

## Procedure for Configuring Outbound QoS Policies

Use the following procedure to configure outbound QoS policies on each Peribit device:

1. For best results, verify that each Peribit device advertises all the subnets it can access. Unadvertised subnets are managed by the QoS settings for the “Other traffic” endpoint. If necessary, use the source/destination filter to prevent data reduction for specific destinations (refer to [“Filtering Data Reduction by Source and Destination” on page 100](#)).
2. Run the Setup Wizard or specify the outbound QoS policies directly:
  - To run the Setup Wizard, refer to [“Using the Outbound QoS Setup Wizard” in the next section](#)). The Setup Wizard creates and applies the **Wizard-PrimeTime** and **Wizard-NonPrimeTime** templates to the selected endpoints.

---

**CAUTION:** Each time you run the Setup Wizard the two existing Wizard templates are overwritten and all customized settings are lost, including the customized settings for each endpoint. To preserve custom settings, use the Setup Wizard for the initial configuration, and then make all subsequent changes directly.

---

- To specify the outbound QoS policies directly:
  - a. Specify the traffic classes and the applications in each class (refer to [“Defining Traffic Classes” on page 163](#)).
  - b. Define one or more templates to specify the priorities and bandwidths for each traffic class (refer to [“Defining Outbound QoS Templates” on page 164](#)).
  - c. Specify the aggregate WAN speed and the circuit speeds for each remote endpoint (refer to [“WAN Circuit Speeds and Router Overhead” on page 148](#) and [“Defining Outbound QoS Endpoints” on page 166](#)).
  - d. Assign a prime-time and nonprime-time template to each endpoint (refer to [“Defining Outbound QoS Settings by Endpoint” on page 161](#)).
  - e. Enable QoS and select a queuing model (refer to [“Starting and Stopping Outbound QoS” on page 172](#)).
- 3. Note that the following changes must be made directly:
  - Change a template for a specific endpoint (refer to [“Defining Outbound QoS Settings by Endpoint” on page 161](#)).
  - Change traffic class names (refer to [“Defining Traffic Classes” on page 163](#)).
  - Add new templates, change a template name, or change just one of the Wizard templates (refer to [“Defining Outbound QoS Templates” on page 164](#)).
  - Define virtual endpoints or exclude address or subnet pairs from bandwidth management (refer to [“Defining Outbound QoS Endpoints” on page 166](#)).
  - Change the ToS/DSCP values for one or more traffic classes (refer to [“Changing Outbound ToS/DSCP Values” on page 170](#)). You can also use ToS/DSCP values for prioritization (refer to [“Starting and Stopping Outbound QoS” on page 172](#)).

## Using the Outbound QoS Setup Wizard

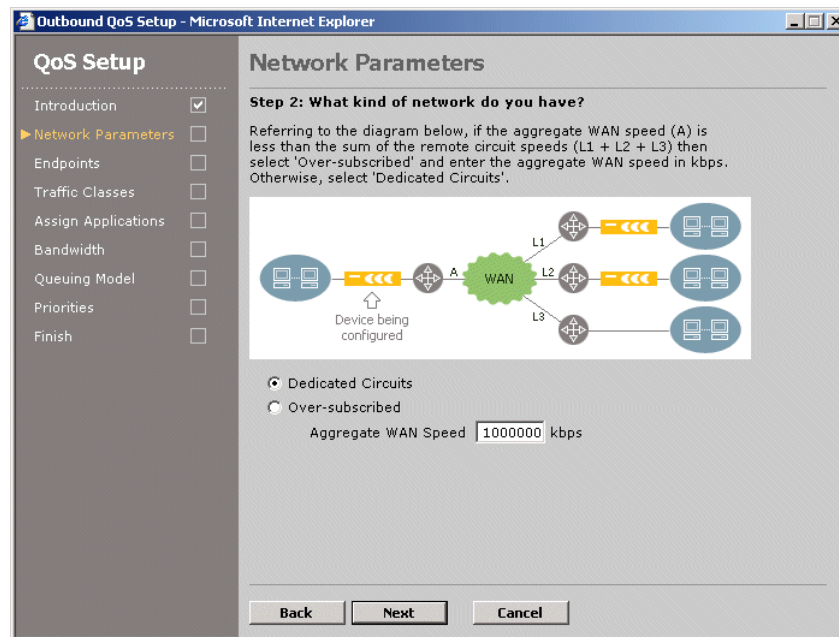
Use the Setup Wizard the first time you define outbound QoS policies. The Setup Wizard creates two identical templates and assigns them to the selected endpoints:

- **Wizard-PrimeTime.** Applies to the prime time hours (critical business hours). To specify the prime time, refer to [“Defining the Prime Time” on page 103](#).
- **Wizard-NonPrimeTime.** Applies to nonprime time hours. To view QoS reports for prime time or nonprime time hours, refer to [“Outbound Bandwidth Statistics” on page 214](#).

Each time you run the Setup Wizard, both of the Wizard templates and all customized settings are overwritten. To change just one of the templates, refer to [“Defining Outbound QoS Templates” on page 164](#).

To run the outbound QoS Setup Wizard:

1. Click **QOS** in the menu frame, and click **Setup Wizard** in the left-hand navigation frame.
2. Click **Enable Outbound QoS** and click **Next**.



**Figure 6-7 Configuring Outbound QoS Network Parameters**

3. Calculate the aggregate WAN speed by adding up the speeds of all the WAN interfaces on the router connected to the current device., and then select one of the following and click **Next**:

- |                    |  |
|--------------------|--|
| Dedicated Circuits | Indicates that the aggregate WAN speed equals or exceeds the sum of the remote WAN speeds whose bandwidths you want to manage (the default).   |
| Over-subscribed    | Indicates that the aggregate WAN speed is less than the sum of the remote WAN speeds. If you select this option, enter the correct speed in the <b>Aggregate WAN Speed</b> field. Be sure to account for router overhead (refer to <a href="#">“WAN Circuit Speeds and Router Overhead” on page 148</a> ). |

**QoS Setup**

Introduction ☒ Network Parameters ☒ **Endpoints** ☐ Traffic Classes ☐ Assign Applications ☐ Bandwidth ☐ Queuing Model ☐ Priorities ☐ Finish ☐

**Endpoints**

**Step 3: For which endpoints do you want to manage bandwidth?**  
Enter the circuit speeds (in kbps) for all endpoints listed here. Then select the endpoints that you want to participate in Bandwidth Management.

IP Address	Device Name	Circuit Speed
<input type="checkbox"/> 192.168.52.22	52/22	<input type="text"/>
<input type="checkbox"/> 192.168.54.22	54/22	<input type="text"/>
<input type="checkbox"/> 192.168.55.100	55/100-SR20	<input type="text"/>
<input type="checkbox"/> 192.168.5.101	SR-192.168.5.101	<input type="text"/>
<input type="checkbox"/> 192.168.52.149	52/149	<input type="text"/>
<input type="checkbox"/> 192.168.53.180	53/180-SR50	<input type="text"/>
<input type="checkbox"/> 192.168.53.199	53/199	<input type="text"/>
Other traffic		default

Select All Clear

Back Next Cancel

Figure 6-8 Configuring QoS Endpoints

4. Select the check box next to the IP address of each remote Peribit device (endpoint) for which you want to manage the outbound bandwidth (or click **Select All**), and enter the remote WAN circuit speed (in Kbps) for each selected endpoint. If Packet Flow Acceleration is enabled for an endpoint, outbound QoS cannot be disabled.

**CAUTION:** Be sure to verify the WAN circuit speed. The actual WAN speed is typically less than the rated speed (refer to [“WAN Circuit Speeds and Router Overhead”](#) on page 148). Exceeding the actual WAN speed effectively shifts bandwidth management to the router, and may cause the router to drop traffic.

Note the following:

- For Peribit devices that support Multi-Path, a “\_Pri” and “\_Sec” are appended to the device name to indicate the primary and secondary path. You can enable QoS for one or both paths. To configure Multi-Path, refer to [“Configuring Policy-Based Multi-Path”](#) on page 113.
- You can use the “Other traffic” endpoint to manage the bandwidth for all traffic that is not sent to one of the selected Peribit devices. For oversubscribed WANs, the “Other traffic” endpoint is shown here, and the two generated templates are applied to it. The circuit speed for “Other traffic” defaults to the aggregate WAN speed.
- If any “No Remote Peribit” virtual endpoints have been defined to manage the non-Peribit traffic sent to specific remote subnets (refer to [“Defining Outbound QoS Endpoints”](#) on page 166), you can change their circuit speeds or disable them. The settings for “Other traffic” and virtual endpoints can be changed in the same manner as other endpoints (refer to [“Defining Outbound QoS Settings by Endpoint”](#) on page 161).

5. Click **Next**. To define your own traffic classes, click **Custom**, and then click **Next**.

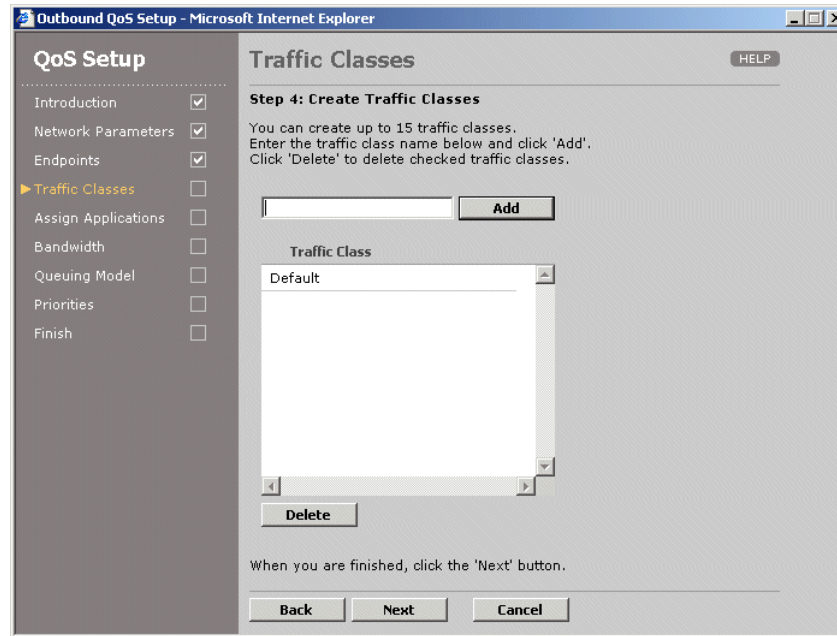


Figure 6-9 Configuring Traffic Classes

6. To add a new traffic class, enter the class name (up to 20 characters) and click **Add**. You can add up to 15 classes. To delete a traffic class, click the check box next to the class name and click **Delete**. Note that the Default class is reserved for undefined application traffic and cannot be deleted. Click **Next**.

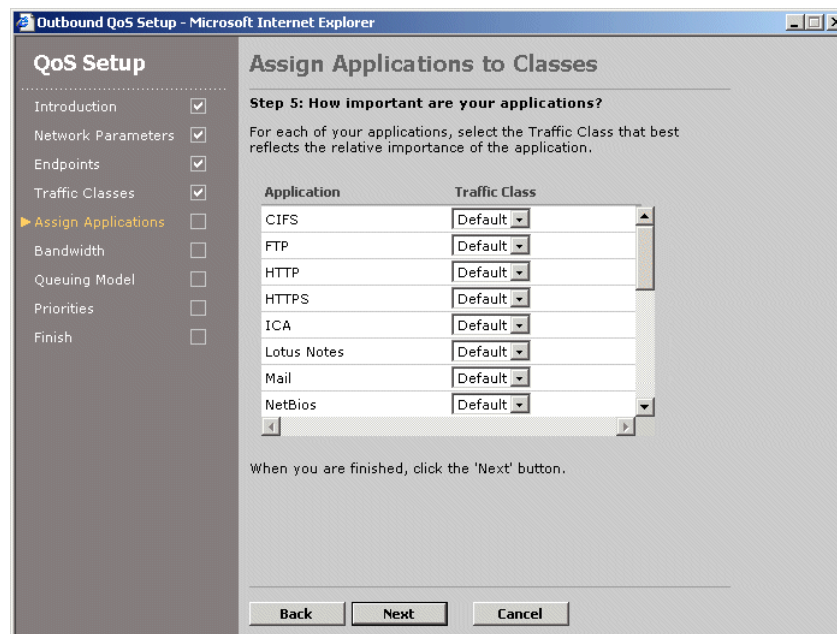


Figure 6-10 Assigning Applications to Traffic Classes

7. Select the appropriate traffic class for each of your defined applications. If one of your network applications is not shown, you must create a application definition for it, as described in [“Managing Applications” on page 90](#). Click **Next**.

**QoS Setup**

- Introduction ☒
- Network Parameters ☒
- Endpoints ☒
- Traffic Classes ☒
- Assign Applications ☒
- Bandwidth** ☐
- Queuing Model ☐
- Priorities ☐
- Finish ☐

### Traffic Class Bandwidth

**Step 6: How much bandwidth should each traffic class have?**

Enter Guaranteed and Maximum Bandwidth limits for the following Traffic Classes.

Traffic Class	Guaranteed Bandwidth	Maximum Bandwidth
Default	0.00 %	100.00 %
Business Critical	40.00 %	100.00 %
Business Standard	20.00 %	100.00 %
Low-Latency	20.00 %	100.00 %
Prohibited	0.00 %	0.00 %

The Guaranteed Bandwidth is the amount of bandwidth that is guaranteed to be available for a traffic class, regardless of the volume of competing traffic from other classes.

The Maximum Bandwidth is the amount of bandwidth that this traffic class will be limited to even if additional bandwidth is available.

Guaranteed and Maximum bandwidths are expressed as a percent of the bottleneck link speed. The total Guaranteed bandwidth across all traffic classes should not exceed 80%.

**Back** **Next** **Cancel**

**Figure 6-11 Defining Guaranteed and Maximum Bandwidths by Traffic Class**

- Enter the bandwidth information for each traffic class, and click **Next**.

**Guaranteed Bandwidth** Percentage of the bandwidth that is guaranteed to be allocated to the applications in the traffic class. Lower values indicate that the traffic in the class is more likely to be delayed. Traffic may be dropped when the guaranteed bandwidth is exceeded, such as during a burst of higher-priority traffic.

The total guaranteed bandwidth across all traffic classes cannot exceed 80%. Also, the total guaranteed bandwidth across all endpoints cannot exceed 80% of the aggregate WAN speed.

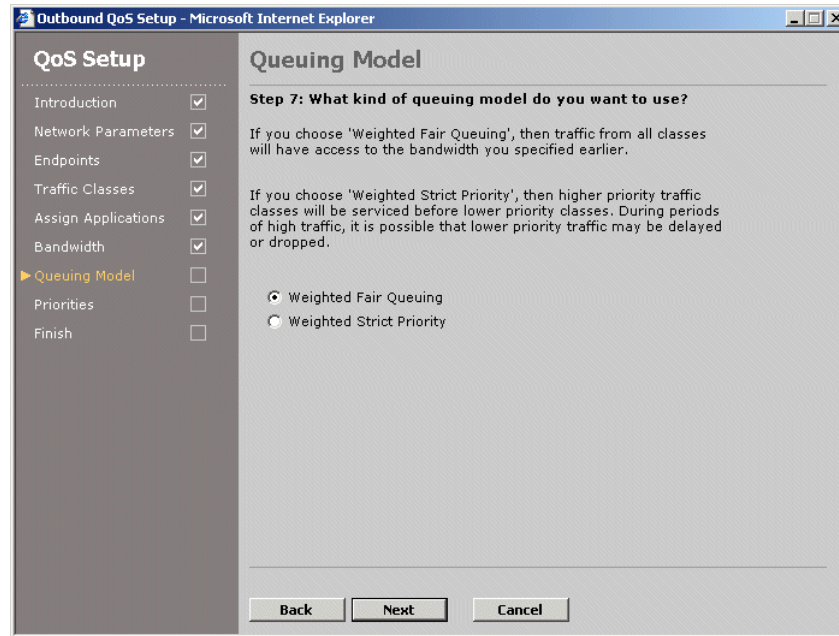
**Maximum Bandwidth** Maximum percentage of the bandwidth that can be allocated to the applications in the traffic class. Traffic is dropped when the maximum bandwidth is exceeded. A zero indicates that all traffic in the class is dropped.

---

**NOTE:** If more than one application is assigned to a class, the specified bandwidths are distributed evenly among the applications.

---





**Figure 6-12** Selecting the Queuing Model

9. Select one of the following queuing models to allocate the excess bandwidth as load conditions change. The excess bandwidth is the unguaranteed bandwidth, plus the guaranteed bandwidth that is not currently in use.

Weighted Fair Queuing	Queues are created for each traffic class, and the excess bandwidth is allocated by processing the queues based on their priority and guaranteed bandwidth.
Weighted Strict Priority	Queues are created for each priority, and the excess bandwidth is allocated by processing the queues based on their priority. Processing is weighted equally for traffic classes that have the same priority.

You can later change the queuing method to use ToS/DSCP values, as described in [“Starting and Stopping Outbound QoS” on page 172](#). Click **Next**.

**QoS Setup**

- Introduction ☒
- Network Parameters ☒
- Endpoints ☒
- Traffic Classes ☒
- Assign Applications ☒
- Bandwidth ☒
- Queuing Model ☒
- Priorities** ☐
- Finish ☐

**Priorities**

**Step 8: Set priorities for each traffic class**

Select a priority for each of the traffic classes. Choose a higher priority number for important traffic classes -- a lower priority number for unimportant traffic classes.

Traffic Class	Priority
Default	0 (Lowest)
Business Critical	0 (Lowest)
Business Standard	0 (Lowest)
Low-Latency	7 (Highest)
Prohibited	0 (Lowest)

Back Next Cancel

**Figure 6-13 Defining Priorities by Traffic Class**

10. Select a priority value (0 to 7) for each traffic class, where 7 is the highest priority. These values are used by the Weighted Fair Queuing and Weighted Strict Priority queuing models to allocate excess (unguaranteed) bandwidth to the competing traffic classes.

---

**NOTE:** These priorities are used only by the Peribit device, and are not related to ToS priorities.

---

11. Click **Next**, click **Submit**, and then click **Close**.
12. Click **QOS** in the menu frame to refresh the Outbound QoS Overview page, which now shows the template name, circuit speed, and guaranteed bandwidths for each endpoint.
13. To retain your changes when the device is restarted, click **SAVE** in the menu frame.

You can now customize the outbound QoS settings for each endpoint, as described in [“Defining Outbound QoS Settings by Endpoint” in the next section](#).



## Defining Outbound QoS Settings by Endpoint

After you run the Setup Wizard to create the initial outbound QoS settings, you can change the prime-time or nonprime-time template assigned to an endpoint or override the template values (class priorities or bandwidths) for a single endpoint. To change the WAN circuit speed for an endpoint, refer to [“Defining Outbound QoS Endpoints” on page 166](#).

To view or change the outbound QoS settings by endpoint:

1. Click **QOS** in the menu frame to open the Outbound QoS Overview page.

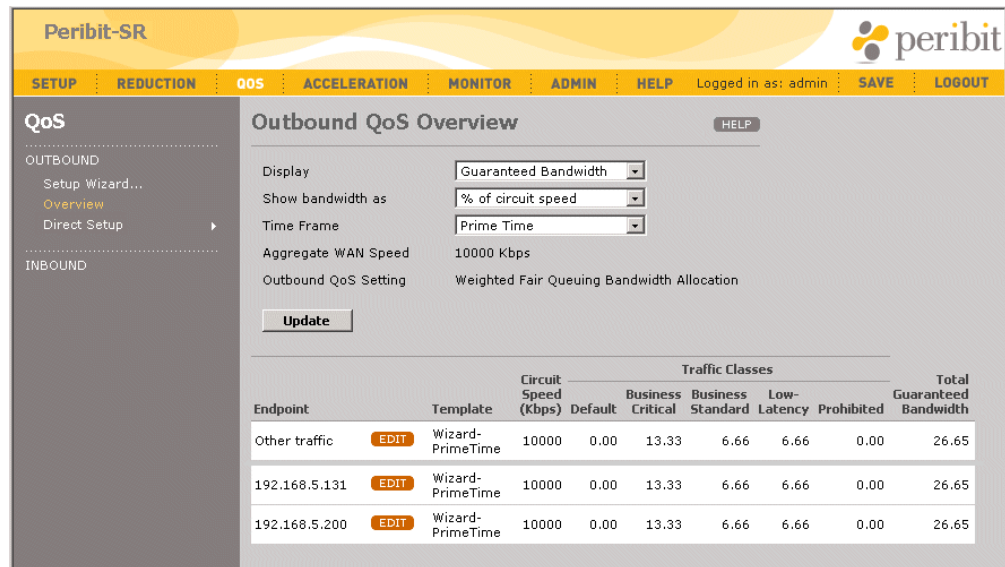


Figure 6-14 Outbound QoS Overview

The Outbound QoS Overview page shows the aggregate WAN speed for the Peribit device, the selected queuing model, and the template name, circuit speed, and guaranteed bandwidths for each remote endpoint.

Note that the “Other traffic” endpoint lets you manage the bandwidth for all traffic that is not sent to one of the other endpoints shown here.

2. To change the data shown for each endpoint, select one or more of the following and click **Update**.
  - Select **Maximum Bandwidth** from the **Display** menu to view the maximum bandwidth values for each endpoint.
  - Select **Kbps** from the **Show bandwidth as** menu to view the bandwidth percentages as circuit speeds.
  - Select **Non Prime Time** from the **Time Frame** menu to view the nonprime-time templates associated with each endpoint. This menu is displayed only if prime time is enabled (refer to [“Defining the Prime Time” on page 103](#)).
3. To change an endpoint’s template or override a template setting, click **EDIT** next to the endpoint name. To override a template, be sure to select the appropriate time frame from the **Time Frame** menu (**Prime Time** or **Non Prime Time**).

**Peribit-SR** peribit

SETUP REDUCTION **QoS** ACCELERATION MONITOR ADMIN HELP Logged in as: admin LOGOUT

**QoS**

OUTBOUND  
Setup Wizard...  
Overview  
Direct Setup

INBOUND

### Outbound QoS Overview > Other traffic

This page determines bandwidth limits for Outbound QoS to the selected endpoint.

Endpoint: Other traffic  
Circuit Speed: 1500 Kbps  
Time Frame: Prime Time

☐ Use QoS template Wizard-PrimeTime  
☒ Use custom setting

Show bandwidth as: % of circuit speed

Traffic Class	Priority	Guaranteed Bandwidth	Maximum Bandwidth
Default	0 (Lowest)	0.00 %	100.00 %
Business Critical	0 (Lowest)	13.33 %	100.00 %
Business Standard	0 (Lowest)	6.67 %	100.00 %
Low-Latency	7 (Highest)	6.67 %	100.00 %
Prohibited	0 (Lowest)	0.00 %	0.00 %
<b>Total</b>		<b>26.67 %</b>	

Bandwidth limits are stored as a percent of circuit speed. If circuit speed is modified, the bandwidth kbps values will also change.

Submit Cancel

Figure 6-15 Changing Endpoint Templates or Template Settings

## 4. Do one of the following:

- To change the template for this endpoint, select a template from the drop-down menu, and click **Submit**. To create new templates, refer to [“Defining Outbound QoS Templates”](#) on page 164.
- To override the current template settings for this endpoint, click **Use custom setting** and change the priority or bandwidth settings for one or more traffic classes, and click **Submit**. Do not include leading zeros on bandwidths (they indicate octal values).

Note that to increase the guaranteed bandwidth for a traffic class on an oversubscribed WAN, you must first decrease the bandwidth on another class (on the same endpoint or a different endpoint), reduce the circuit speed, or increase the aggregate WAN speed. The Setup Wizard adjusts the guaranteed bandwidths for you (refer to [“Using the Outbound QoS Setup Wizard”](#) on page 155).

5. To retain your changes when the device is restarted, click **SAVE** in the menu frame.

The Outbound QoS Overview page is displayed. When you override the template settings for an endpoint, the template name is changed to **None**. You can later reapply the template to restore the original settings.

If you customize the settings for specific endpoints, rather than change the template, new templates are created whose names include the IP address of the endpoint. To view these templates, use the “show -run qos outbound” CLI command on the device.

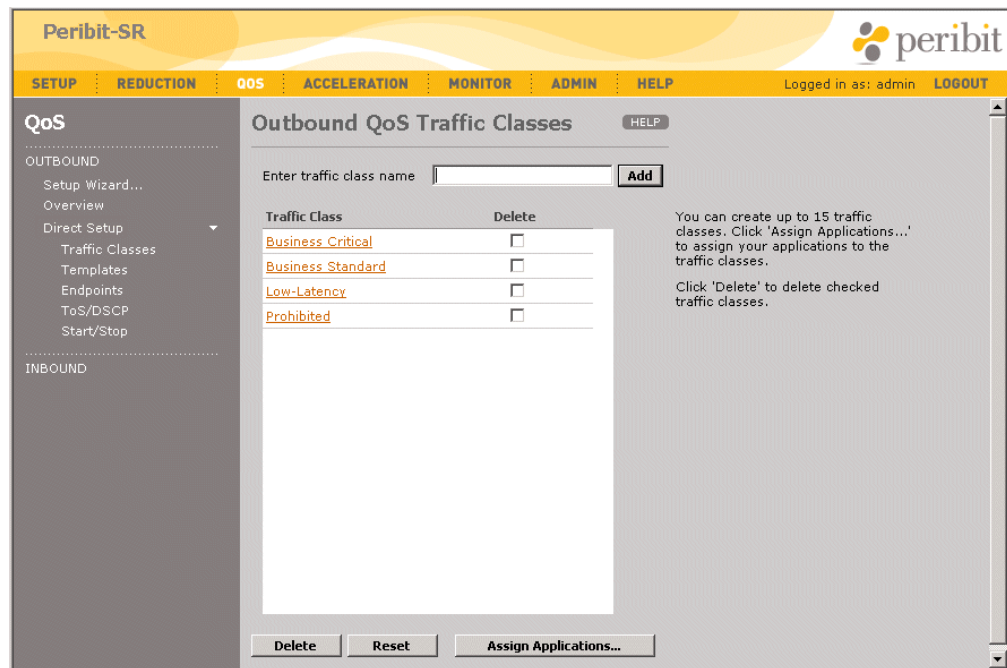
- PTO-<IP\_address> for customized prime-time templates
- NTO-<IP\_address> for customized nonprime-time templates

## Defining Traffic Classes

Outbound application traffic is managed by traffic class. You can assign one or more applications to each of the predefined traffic classes provided by the Setup Wizard or create your own classes. Initially, all applications belong to the Default class. The Default class always contains the undefined application traffic, so it cannot be renamed or deleted. Note that an application can belong to only one traffic class, but it can belong to different classes on different Peribit devices. You can have up to 16 traffic classes.

To define traffic classes and add applications to a class:

1. Click **QOS** in the menu frame, click **Direct Setup** in the left-hand navigation frame, and then click **Traffic Classes**.



**Figure 6-16 Defining Outbound QoS Traffic Classes**

From the Outbound QoS Traffic Classes page, you can:

- Add a new traffic class. Enter the class name (up to 20 characters), and click **Add**.
  - Change a class name. Click the class name, enter the new name, and click **Submit**.
  - Delete a traffic class. Click the check box next to the class name, and click **Delete**. Any applications in the deleted class are moved to the Default class.
2. To change the applications assigned to each traffic class, click **Assign Applications**, select a traffic class for each application, and click **Submit**.
  3. To retain your changes when the device is restarted, click **SAVE** in the menu frame.

## Defining Outbound QoS Templates

Outbound QoS templates specify the priority, guaranteed bandwidth, and maximum bandwidth for each traffic class. You can change the templates created by the Setup Wizard or create new templates. To apply a QoS template to an endpoint, refer to [“Defining Outbound QoS Settings by Endpoint” on page 161](#).

To define outbound QoS templates:

1. Click **QOS** in the menu frame, click **Direct Setup** in the left-hand navigation frame, and then click **Templates**.

The screenshot shows the 'Peribit-SR' interface with the 'QOS' menu selected. The left navigation pane shows 'Direct Setup' > 'Templates'. The main area is titled 'Outbound QoS Templates'. It contains a table with two rows of templates:

QoS Template	Delete
Wizard-PrimeTime	<input type="checkbox"/>
Wizard-NonPrimeTime	<input type="checkbox"/>

Below the table are buttons: Submit, Reset, and New Template... A help text on the right states: 'QoS templates are used to define priority and bandwidth allocations for the various traffic classes.'

Figure 6-17 Defining Outbound QoS Templates

From the Outbound QoS Templates page, you can:

- Add a new template, as described in Step 2 through Step 4.
- Change a template name or settings. Click the template name, change the template name and/or the settings for each traffic class, and click **Submit**.
- Delete a template. Click the check box next to the template name, and click **Submit**. If the template is applied to an endpoint, all priority and guaranteed bandwidth values are set to zero for that endpoint. Maximum bandwidth values are set to 100%.

2. To add a new template, click **New Template**.

The screenshot shows the 'Peribit-SR' interface with the 'QOS' menu selected. The left navigation pane shows 'Direct Setup' > 'Templates'. The main area is titled 'Outbound QoS Templates > New Template'. It contains a form to create a new template:

Template Name:

Traffic Class	Priority	Bandwidth Limit (%)	
		Guaranteed	Maximum
Default	0 (Lowest)	0	100
Business Critical	0 (Lowest)	0	100
Business Standard	0 (Lowest)	0	100
Low-Latency	0 (Lowest)	0	100
Prohibited	0 (Lowest)	0	100

Below the table are buttons: Submit, Reset, and Cancel. A help text on the right states: 'For each traffic class, select a priority and then set the guaranteed and maximum bandwidth limits. 'Guaranteed bandwidth' is the bandwidth reserved for a given traffic class regardless of the amount of traffic from other classes. 'Maximum bandwidth' is an upper limit on bandwidth allocated for a given traffic class, even if there is no other traffic from other classes. These values are percentages of an endpoint's circuit speed.'

Figure 6-18 Defining a New QoS Template

3. Enter the following information:

Template Name	Enter the name of the template (up to 20 characters).
Priority	Select a priority value (0 to 7), where 7 is the highest priority. These values are used by the Weighted Fair Queuing and Strict Priority queuing models to allocate excess bandwidth to the competing classes of applications.
Guaranteed Bandwidth	<p>Enter a percentage of the bandwidth that is guaranteed to be allocated to the applications in the traffic class. Lower values indicate that the traffic in the class is more likely to be delayed. Traffic may be dropped when the guaranteed bandwidth is exceeded, such as during a burst of higher-priority traffic.</p> <p>The total guaranteed bandwidth across all traffic classes cannot exceed 80%. Also, the total guaranteed bandwidth across all endpoints cannot exceed 80% of the aggregate WAN speed.</p>
Maximum Bandwidth	Enter the maximum percentage of the bandwidth that can be allocated to the applications in the traffic class. Traffic is dropped when the maximum bandwidth is exceeded. A zero indicates that all traffic in the class is dropped.

---

**NOTE:** If more than one application is assigned to a class, the bandwidths defined for the class are distributed evenly among the applications.

---

4. Click **Submit** to activate the changes, or click **Reset** to discard them.
5. To retain your changes when the device is restarted, click **SAVE** in the menu frame.

## Defining Outbound QoS Endpoints

Each device can manage the outbound bandwidth for one or more remote Peribit devices (endpoints). After you run the Setup Wizard, you can:

- Enable or disable bandwidth management for any endpoint.
- Create virtual endpoints to manage the traffic to specific remote subnets that do not have a Peribit device.
- Change the aggregate WAN speed or remote WAN circuit speeds.
- Enable congestion control for one or more endpoints (Sequence Mirror devices only).
- Specify LAN/WAN address or subnet pairs to be excluded from bandwidth management.

---

**NOTE:** Traffic bursts between excluded addresses are unrestrained by priority or bandwidth considerations, and may cause other traffic to be dropped by the router.

---

For oversubscribed WANs, bandwidth percentages are not adjusted when you change the selected endpoints, the aggregate WAN speed, or the remote circuit speeds, and you may have to decrease some speeds or guaranteed percentages before increasing others. If you use the Setup Wizard to change QoS settings, all percentages are adjusted automatically (refer to “Using the Outbound QoS Setup Wizard” on page 155).

To define the outbound QoS endpoints:

1. Click **QOS** in the menu frame, click **Direct Setup** in the left-hand navigation frame, and then click **Endpoints**.

**Peribit-SM**  
8 8

SETUP REDUCTION **QOS** ACCELERATION MONITOR ADMIN HELP Logged in as: admin SAVE LOGOUT

**QoS**

OUTBOUND  
Setup Wizard...  
Overview  
Direct Setup  
Traffic Classes  
Templates  
**Endpoints**  
ToS/DSCP  
Start/Stop

INBOUND

### Outbound QoS Endpoints

Outbound QoS is currently enabled. You can enable or disable Outbound QoS by using the Setup Wizard or from the 'Start/Stop' page.

If Outbound QoS is enabled, then only outbound traffic destined for the checked endpoints below will be affected.

Peribit devices are automatically included in the list below. If you want to enable QoS to endpoints that are NOT accessed through a Peribit device, then you can manually add the endpoint to the list by clicking **ADD**. To [view a list of remote networks NOT accessed through a remote Peribit device](#), click this link.

Aggregate WAN Speed  Kbps

☒ Enable Congestion Control when sending traffic to:

☐ All QoS-enabled Peribit devices

☒ ONLY Peribit devices checked under "Congestion Control"

Endpoint	Name	Circuit Speed (Kbps)	Congestion Control	Min. Speed (Kbps)
<input type="checkbox"/> Other traffic		100000	<b>ADD...</b>	
<input checked="" type="checkbox"/> No remote Peribit	192.168.53.181	100	<b>DELETE</b>	
<input checked="" type="checkbox"/> 192.168.53.5	53/5-glacier	100000	<input type="checkbox"/>	<input type="text"/>

Endpoints enabled for acceleration cannot be disabled for QoS.

**Select All** **Clear**

**Submit** **Reset** **Exclusions...**

**Figure 6-19 Enabling Bandwidth Management by Endpoint**

From the Outbound QoS Endpoints page, you can:

- Change the total WAN speed of the router associated with the current device. Enter the value in the **Aggregate WAN Speed** field (in Kbps). For a description of the aggregate WAN speed, refer to [“Dedicated and Oversubscribed WANs” on page 149](#).
  - Enable or disable outbound QoS for specific remote endpoints, as described in Step 2.
  - Add or delete a virtual endpoint for remote subnets that do not have a Peribit device, as described in Step 3. To view the subnets associated with the current virtual endpoints, click **view a list of remote networks...**
  - Enable congestion control for one or more endpoints, as described in Step 4.
  - Change a virtual endpoint’s name or subnets. Click the endpoint name, make the changes, and click **Submit**.
  - Exclude specific address or subnet pairs from bandwidth management, as described in Step 5 through Step 7.
2. To enable bandwidth management for a remote endpoint, select the check box next to the endpoint (or click **Select All**). Enter the remote WAN circuit speed (in Kbps) for each selected endpoint, and click **Submit**. If Packet Flow Acceleration is enabled for an endpoint, outbound QoS cannot be disabled (the endpoint is greyed out).

---

**CAUTION:** Be sure to verify the WAN circuit speed. The actual WAN speed is typically less than the rated speed (refer to [“WAN Circuit Speeds and Router Overhead” on page 148](#)). Exceeding the actual WAN speed effectively shifts bandwidth management to the router, and may cause the router to drop traffic.

---

Note the following:

- For Peribit devices that support Multi-Path (refer to [“Configuring Policy-Based Multi-Path” on page 113](#)), a “\_Pri” or “\_Sec” is appended to the device name to indicate the primary or secondary path. You can enable QoS for one or both paths.
- The “Other traffic” endpoint is always enabled, and can be used to manage the bandwidth for all traffic that is not sent to one of the selected endpoints. The circuit speed for “Other traffic” defaults to the aggregate WAN speed.
- When you select a new endpoint, all the endpoint’s traffic classes have a priority and guaranteed bandwidth of zero, and a maximum bandwidth of 100%. To change the default settings, refer to [“Defining Outbound QoS Settings by Endpoint” on page 161](#).



3. To add a virtual endpoint to manage the traffic to specific remote subnets that do not have a Peribit device, click **ADD**.

**Figure 6-20 Adding Virtual Endpoints**

Specify the following information, and click **Submit**. The maximum number of virtual endpoints (up to 120) depends on the device type (2 for the SR-15, 5 for the SR-20 and SM-250)

Name	Enter the endpoint name (up to 20 characters).
Circuit Speed	Enter the WAN circuit speed associated with this endpoint (in Kbps).
Subnets	Enter the IP addresses or subnets associated with this endpoint (one per line). The subnet format is:  <IP address>/<subnet mask>  Subnets specified here are ignored if they are also advertised by a Peribit device.

To delete a virtual endpoint, click **DELETE** next to the endpoint. Traffic to deleted virtual endpoints is managed by the “Other-traffic” endpoint.

4. On a Sequence Mirror device, if the WAN bandwidth to a remote Sequence Mirror is variable, such as for Frame Relay or shared satellite links, you can enable congestion control for traffic sent to that device. The Sequence Mirror will then dynamically adjust the bandwidth allocation for each endpoint based on the current congestion.

To enable congestion control:

- a. Select **Enable Congestion Control...** and select one of the following options:
  - **All QoS-enabled Peribit devices.** Applies congestion control to all remote Peribit devices for which QoS is enabled (default).
  - **ONLY Peribit devices checked under “Congestion Control”.** Select the **Congestion Control** check box for one or more QoS-enabled endpoints.



- b. Optionally, enter a minimum circuit speed for each endpoint. For Frame Relay, use the CIR; for a shared satellite link, use a percentage of the total speed, depending on how many devices share the link. For MPLS networks, use the service level guarantee.

---

**NOTE:** Enabling congestion control for remote Sequence Reducers has no effect.

---

5. To exclude one or more LAN/WAN pairs of addresses or subnets from bandwidth management, click **Exclusions**.

**Figure 6-21 Excluding Subnets or Hosts from Bandwidth Management**

To avoid managing traffic addressed to the router on the WAN side of the Peribit device, all LAN traffic sent to the device's local subnet is excluded by default. This ensures that we manage only the traffic sent across the WAN.

6. Enter a local IP address or subnet in the **Between LAN side network** field, and enter a remote IP address or subnet in the **And WAN side network** field. Enter an asterisk (\*) to indicate any address. Click **Add**.

To remove an entry, click **DELETE** next to the address pair.

7. Click **Submit** to activate the changes, or click **Reset** to discard them.
8. To retain your changes when the device is restarted, click **SAVE** in the menu frame.

## Changing Outbound ToS/DSCP Values

The ToS/DSCP values on incoming traffic from the LAN can be modified to support other QoS devices in your network. For each traffic class, you can specify a Type of Service (ToS) IP precedence value or a Differentiated Services Code Point (DSCP) value, depending on the QoS scheme in use. The specified ToS/DSCP values apply to all traffic in the class, regardless of whether the traffic is reduced or outbound QoS is enabled.

You can also preserve the incoming ToS/DSCP values in the Peribit “meta-packets,” so that each meta-packet encapsulates only packets that have the same ToS/DSCP value. This allows other QoS devices in the path to manage the meta-packets in the same manner as the individual packets. By default, meta-packets have a ToS/DSCP value of zero and can encapsulate packets with varying ToS/DSCP values.

If outbound QoS is enabled, the ToS/DSCP values can also be used for prioritization (refer to [“Starting and Stopping Outbound QoS” on page 172](#)).

ToS IP precedence values (0 to 7) use the upper three bits of the Diffserv field; DSCP values (0 to 63) use the upper six bits. The upper three bits of DSCP are used like ToS to indicate the priority (7 is the highest priority). Table 6-4 lists the equivalent DSCP values for each ToS IP precedence value.

**Table 6-4 Equivalent ToS and DSCP Values**

IP Precedence	DSCP
0	0
1	8
2	16
3	24
4	32
5	40
6	48
7	56

To set ToS/DSCP values by traffic class:

1. Click **QOS** in the menu frame, click **Direct Setup** in the left-hand navigation frame, and then click **ToS/DSCP**.

**Figure 6-22 Setting ToS/DSCP Values**

2. To set ToS/DSCP values by traffic class, select **Set IP Precedence bits...** or **Set DSCP bits...** to specify whether you want to enter ToS or DSCP values. The DSCP option is disabled if DSCP values are set by Multi-Path (refer to [“Enabling Multi-Path and Defining Marking Methods” on page 115](#)) or if ToS marking for router-based balancing is in use (refer to [“Configure Route Command” on page 306](#)).

The default selection, **Do not alter ToS/DSCP bits**, indicates that Peribit meta-packets have a ToS/DSCP value of zero. If you want to preserve all the incoming values, and have each meta-packet reflect the ToS/DSCP value of its encapsulated packets, select **Set IP Precedence bits...** or **Set DSCP bits...** and do not check any of the traffic classes.

3. Select the check boxes next to the traffic classes whose ToS/DSCP values you want to set (or click **Select All**).
4. Enter a ToS value (0 to 7) or a DSCP value (0 to 63) in the **ToS/DSCP value** field for each of the selected classes. The value specified for each class is applied to the traffic for all applications in the selected class. To assign applications to a traffic class, refer to [“Defining Traffic Classes” on page 163](#).

---

**NOTE:** Changes to the ToS/DSCP values do not affect the outbound QoS reports. Also, these values are overridden by the ToS/DSCP settings defined for Multi-Path (refer to [“Configuring Policy-Based Multi-Path” on page 113](#)).

---

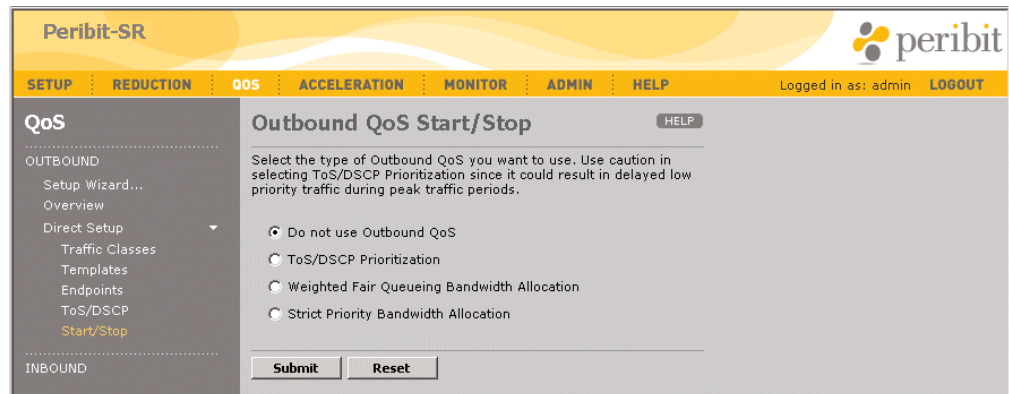
5. After reduced traffic from remote Peribit devices is assembled, the **Restore original ToS/DSCP bits after assembly** option resets the ToS/DSCP value to its original value (if the remote Peribit device changed it).
6. To retain your changes when the device is restarted, click **SAVE** in the menu frame.

## Starting and Stopping Outbound QoS

You can start or stop outbound bandwidth management at any time, as well as change the prioritization method used to allocate the excess (unguaranteed) bandwidth among the contending applications. The selected prioritization model applies to all the managed endpoints.

To stop the outbound QoS service or change the prioritization:

1. Click **QOS** in the menu frame, click **Direct Setup** in the left-hand navigation frame, and then click **Start/Stop**.



**Figure 6-23 Starting and Stopping Outbound QoS**

2. To stop the outbound QoS service, click **Do not use Outbound QoS**. If Packet Flow Acceleration (PFA) is enabled, you cannot disable outbound QoS.
3. To restart the service or change the prioritization method used for each endpoint, select one of the following. To use PFA, select Weighted Fair Queuing or Weighted Strict Priority.
  - **Weighted Fair Queueing Bandwidth Allocation.** Queues are created for each traffic class, and the excess bandwidth is allocated by processing the queues based on their priority and guaranteed bandwidth.
  - **Strict Priority Bandwidth Allocation.** Queues are created for each priority, and the excess bandwidth is allocated by processing the queues based only on priority.
  - **ToS/DSCP Prioritization.** Queues are created based on the ToS/DSCP values, and the higher priority queues are processed first. This method is the most likely to cause low-priority traffic to be dropped because the QoS templates are ignored (no guaranteed or maximum bandwidths). To specify the ToS/DSCP values by traffic class before prioritization is applied, refer to [“Changing Outbound ToS/DSCP Values” on page 170](#).

---

**NOTE:** You cannot select ToS/DSCP prioritization if PFA is enabled. Also, the outbound QoS reports do not apply when ToS/DSCP prioritization is used.

---

4. Click **Submit** to activate the changes, or click **Reset** to discard them.
5. To retain your changes when the device is restarted, click **SAVE** in the menu frame.

## Configuring Inbound QoS Policies

Inbound bandwidth management lets you specify maximum bandwidths for four classes of incoming WAN traffic destined for the Local Area Network (LAN). Setting maximum bandwidths for each class ensures that low-priority traffic, such as Web traffic, does not interfere with mission-critical applications. Bandwidths are specified as percentages of the aggregate WAN speed, and traffic that exceeds the maximum bandwidths is dropped.

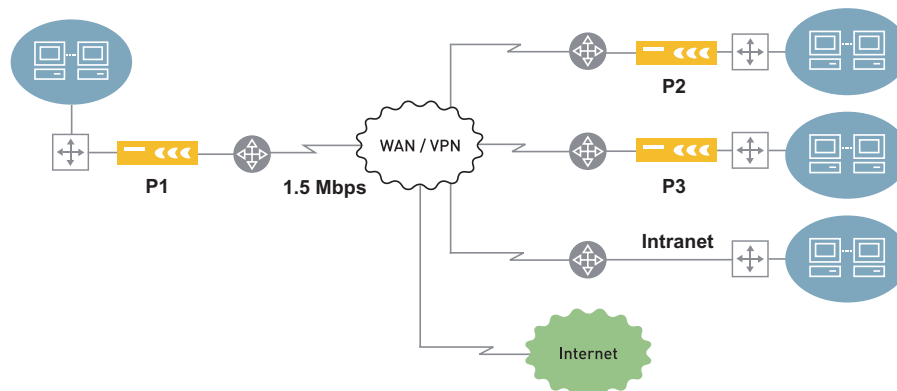
**NOTE:** Inbound QoS applies only to traffic received on the Remote interface. Thus, inbound QoS does not apply to off-path Peribit devices (which use only the Local interface). Also, on devices configured for tunnel switching, inbound QoS has no effect on incoming WAN traffic on the Local interface.

The following table describes the four traffic classes for inbound bandwidth management.

**Table 6-5 Inbound Bandwidth Management Classes**

Class	Description
Reduced	Reduced traffic from other Peribit devices.
Intranet	Unreduced TCP traffic from a specified list of IP subnets. Use the Top Traffic report to help create the list of subnets (refer to <a href="#">“Viewing and Exporting Top Traffic Statistics”</a> on page 222).
TCP	TCP traffic that is not in the Reduced or Intranet class.
Default	All traffic that is not in the Reduced, Intranet, or TCP class.

For example, to enable inbound bandwidth management on P1 in Figure 6-24, set the aggregate WAN speed to 1500 Kbps (1.5 Mbps). You then set maximum bandwidth percentages for one or more of the four traffic classes. In this example, you might set the maximum bandwidth percentage for the Default class to 10% to limit low-priority traffic from the public Internet.



**Figure 6-24 Configuring Inbound Bandwidth Management**

To configure the inbound QoS service:

1. Click **QOS** in the menu frame, and then click **INBOUND** in the left-hand navigation frame.

**Peribit-SR** peribit

[SETUP](#)
[REDUCTION](#)
[QOS](#)
[ACCELERATION](#)
[MONITOR](#)
[ADMIN](#)
[HELP](#)
Logged in as: admin [LOGOUT](#)

**QoS**

OUTBOUND

Setup Wizard...

Overview

Direct Setup

**INBOUND**

**Inbound QoS**

If 'Enable Inbound QoS' is checked, traffic from the following four predefined traffic classes will be limited to the specified maximum bandwidths.

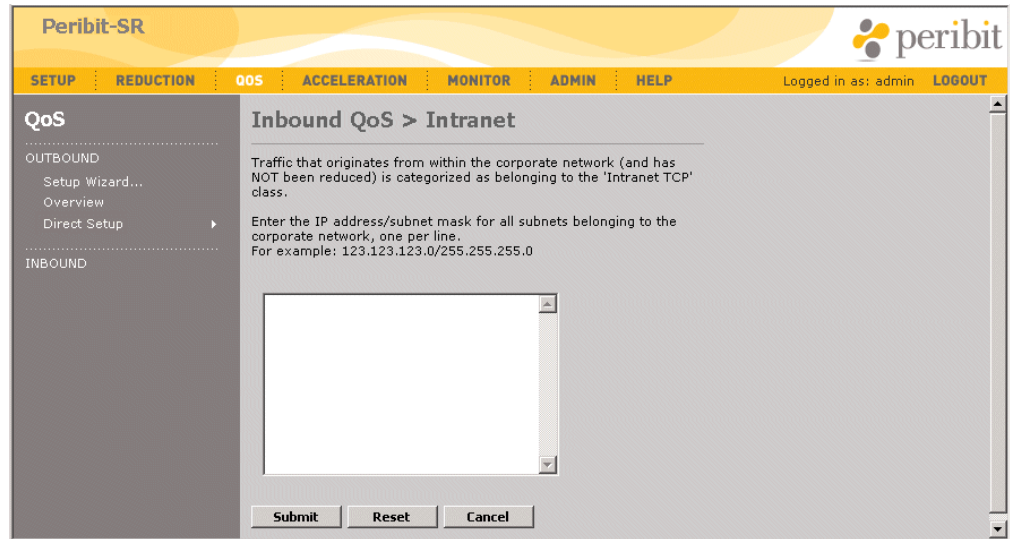
☐ Enable Inbound QoS

Aggregate WAN Speed  Kbps

Traffic Class	Maximum Bandwidth	Description
Reduced	<input type="text"/> 100 %	Any traffic that has been reduced by a Peribit device.
<a href="#">Intranet</a>	<input type="text"/> 100 %	TCP traffic originating from the corporate network that has NOT been reduced.
TCP	<input type="text"/> 100 %	TCP traffic NOT originating from the corporate network.
Default	<input type="text"/> 100 %	All other protocols (e.g. UDP, streaming)

**Figure 6-25 Configuring Maximum Inbound QoS Bandwidths**

2. To start the inbound QoS service, click **Enable Inbound QoS**.
3. Add up the speeds of all the WAN interfaces on the router connected to the current Peribit device, and enter the value (in Kbps) in the **Aggregate WAN Speed** field.
4. Enter the maximum bandwidth of each traffic class as a percentage of the aggregate WAN speed.
5. Click **Submit** to activate the changes, or click **Reset** to discard them.
6. Click **Intranet** to specify the remote subnets whose traffic belongs to the Intranet class.



**Figure 6-26** Configuring Subnets for the Inbound QoS Intranet Class

7. In the list box, enter the remote subnets (one per line) whose traffic belongs to the Intranet traffic class. The subnet format is:

<IP address>/<subnet mask>

8. Click **Submit** to activate the changes, or click **Reset** to discard them.
9. To retain your changes when the device is restarted, click **SAVE** in the menu frame.

## Summary of Key Terms

The following terms and concepts are key to understanding outbound QoS:

- **Aggregate WAN speed.** Sum of the WAN circuit speeds on the router adjacent to the Peribit device.
- **Dedicated WAN.** The aggregate WAN speed equals or exceeds the sum of the endpoint circuit speeds.
- **Endpoint circuit speed.** WAN circuit speed associated with a remote Peribit device or a “virtual” endpoint (no Peribit device).
- **Excess bandwidth.** Difference between the total available bandwidth and the guaranteed bandwidth currently being used.
- **Guaranteed bandwidth.** Amount of bandwidth guaranteed to a given traffic class.
- **Maximum bandwidth.** Maximum amount of bandwidth a traffic class can consume.
- **Oversubscribed WAN.** The aggregate WAN speed is less than the sum of the endpoint circuit speeds.
- **QoS template.** Specifies a priority, guaranteed bandwidth, and maximum bandwidth for each traffic class. You can apply a different QoS template to the traffic sent to each remote Peribit device.

- **Queuing model.** Scheduling algorithm that allocates bandwidth to each traffic class. The queuing models are Weighted Fair Queuing (WFQ) and Weighted Strict Priority (WSP).
- **Setup Wizard.** Prompts you to specify the QoS settings for your network, including WAN link speeds, traffic classes, the priority and bandwidths for each class, and the queuing model. For an oversubscribed WAN, the Setup Wizard automatically adjusts the guaranteed bandwidths to ensure fair traffic delivery to each endpoint.
- **Traffic class.** A group of one or more applications.



## Chapter 7 Configuring Packet Flow Acceleration

The following sections describe how to configure Packet Flow Acceleration (PFA):

- [“Overview of Packet Flow Acceleration” in the next section](#)
- [“Requirements for Using Packet Flow Acceleration” on page 181](#)
- [“Defining Outbound QoS Settings for PFA” on page 182](#)
- [“Enabling Packet Flow Acceleration by Endpoint” on page 182](#)
- [“Enabling Packet Flow Acceleration by Application” on page 185](#)

### Overview of Packet Flow Acceleration

While data reduction effectively increases the available WAN bandwidth, application performance may be further constrained by network latency. Packet Flow Acceleration (PFA) provides four methods to improve the performance of reduced TCP application flows across high-speed, high-latency WAN links. For Peribit devices that support Multi-Path, you can enable PFA for the primary and/or secondary paths.

The following topics describe each acceleration method:

- [“Flow Pipelining” in the next section](#)
- [“Fast Connection Setup” on page 179](#)
- [“Active Flow Pipelining” on page 180](#)
- [“Forward Error Correction” on page 181](#)

### Flow Pipelining

Flow Pipelining can accelerate the TCP application traffic between two Peribit devices by increasing the amount of data sent at one time (the receive window) to 64 KB. The receive window for many clients is 16 KB, so the receiving device stores and forwards the data to the client, as needed.

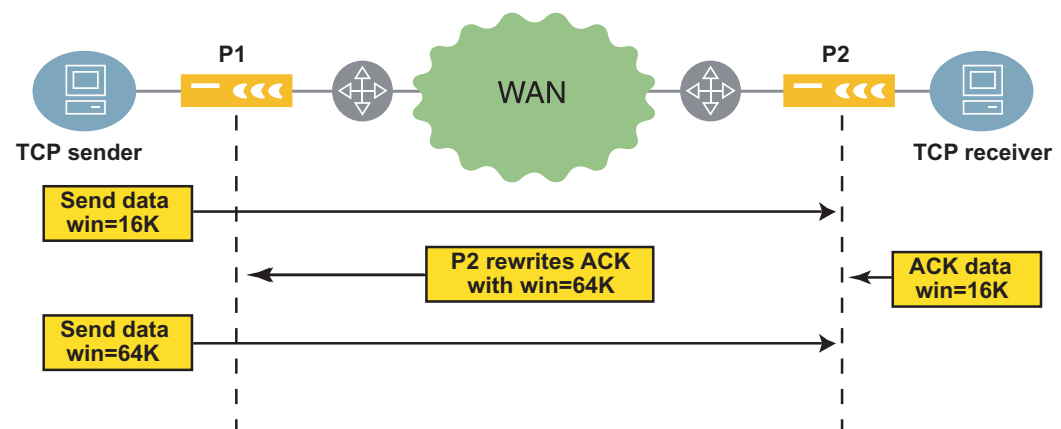


Figure 7-1 Flow Pipelining

Flow Pipelining is intended for applications that do large data transfers, such as FTP and CIFS, over high-speed, high-latency WAN links. In addition, the WAN's maximum effective window size, given by the following formula, must be greater than 16 KB:

$$\text{Max. window size} = (\text{effective bandwidth} * \text{latency}) / 8$$

Flow Pipelining is most effective when the maximum receive window size is 64 KB or greater, and the default TCP window size is 16 KB. The effective bandwidth reflects the increased bandwidth achieved by data reduction. For example, if the data reduction on a T1 link (1.5 Mbps) is 50%, the effective bandwidth is twice the T1 speed. If the latency on such a link is 50 ms, the maximum window size is:

$$(3,088,000 \text{ bps} * 0.05 \text{ seconds}) / 8 = 19,300 \text{ bytes}$$

In this case, if the default TCP window size is 16 KB, Flow Pipelining can provide only a marginal improvement. However, if the latency is 200 ms:

$$(3,088,000 \text{ bps} * 0.200 \text{ seconds}) / 8 = 77,200 \text{ bytes}$$

Here, increasing the window size from 16 KB to 64 KB should greatly improve performance.

---

**NOTE:** Sessions cannot be accelerated if the host's TCP window scale option is enabled or if the TCP receive window is already set to 64 KB.

---

Figure 7-2. shows an example of the statistics provided for Flow Pipelining. The acceleration factor is the actual average throughput divided by the estimated throughput without acceleration. Note that performance improvements will be more noticeable to users as the accelerated session count and traffic load increases.

Application	Total TCP Sessions (count)	Accelerated Sessions (count)	Traffic (MB)	Average Session Throughput (Mbps)		Acceleration Factor
				Actual	w/o Accel.*	
FTP	56	56	369	123	61	2.1 X
CIFS	12	12	1235	76	24	3.1 X
HTTP	78	78	698	28	7	4.2 X
Others	17495	17495	76	8	5	1.7 X

**Figure 7-2 Sample Flow Pipelining Statistics**

Fast Connection Setup

With Fast Connection Setup (FCS), the sending Peribit device locally acknowledges the initial session request for each new session if the destination is known to be active. FCS saves one round-trip time (RTT) for each session, and is intended for applications that have many short sessions, such as HTTP 1.0 and NetBios. Short sessions are those that last less than ten times the round-trip time.

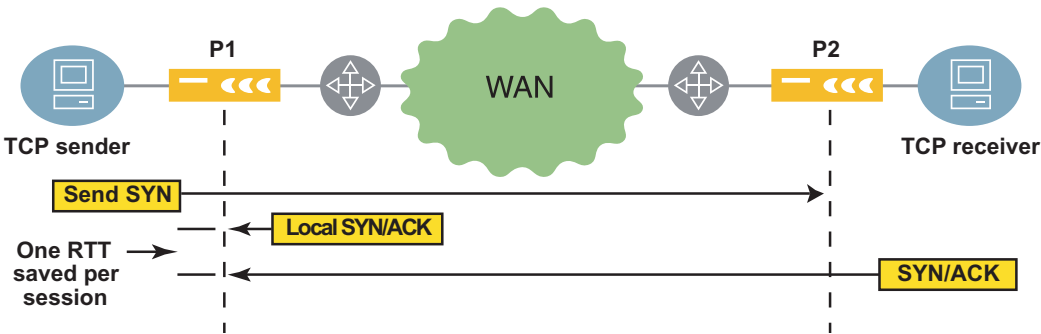


Figure 7-3 Fast Connection Setup

FCS is particularly useful in pre-Windows 2000 environments, where NetBios (not CIFS) is used for file transfer. FCS is also beneficial for HTTP 1.0 traffic (pre-Windows 2000) as it creates more short-lived TCP connections than HTTP 1.1. Some custom enterprise WAN applications may also benefit from FCS.

FCS is most effective in high latency environments, because each RTT that is saved per session represents a larger slice of time as the latency increases. If latency is very low (LAN latencies for example), FCS will not provide much benefit.

Figure 7-4. shows an example of the FCS statistics. FCS is applied only to sessions that last less than ten times the round-trip time (RTT). If a specific application traffic flow has five consecutive short sessions, FCS is applied to all subsequent identical traffic flows. The average session acceleration is calculated as follows:

$$100 - [100 \text{ (Accelerated session time)} / (\text{Session time without acceleration})]$$

Note that performance improvements will be more noticeable to users as the percentage of accelerated sessions increases. In Figure 7-4, the FTP gains apply to a small number of sessions that probably affect only the traffic on the control port.

Application	Total TCP Sessions (count)	Short Sessions*		Average Short Session Time (msec)		Average Short Session Acceleration (percent)				
		(count)	(percent)	with Accel.	w/o Accel.					
HTTP	329	121	36.8%	772.30	1020.51	24.3%	<div></div>	<div></div>	<div></div>	<div></div>
FTP	714	68	9.5%	873.91	1088.90	19.7%	<div></div>	<div></div>	<div></div>	<div></div>

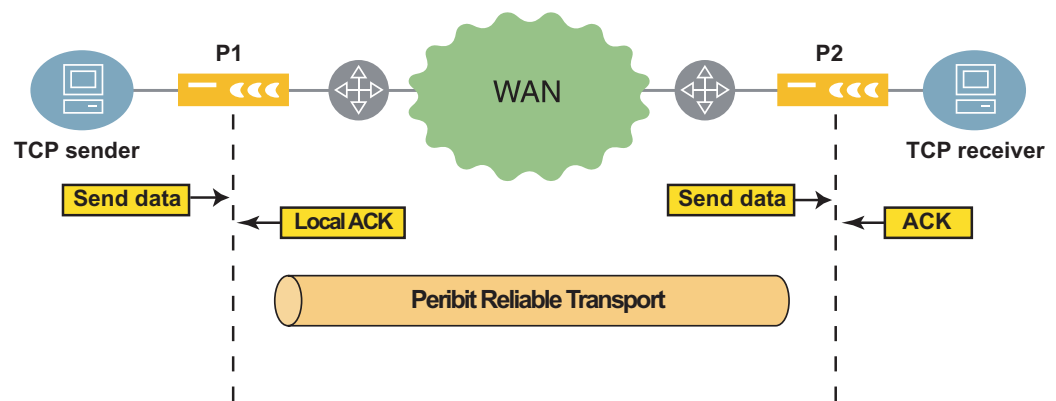
Figure 7-4 Sample Fast Connection Setup Statistics

## Active Flow Pipelining

Active Flow Pipelining (AFP) is intended primarily for high-latency environments, such as satellite connections, and long-haul high-bandwidth links, such as E3 and T3. In these environments, TCP slows down the transmission of data (reduces the receive window) because it interprets the long wait time for acknowledgements (ACKs) as a sign of network congestion.

Active Flow Pipelining solves this problem by terminating each TCP session locally. The result is three independent sessions—between the TCP source and the sending Peribit device, between the two Peribit devices, and between the receiving Peribit device and the destination. This allows all transmissions to be acknowledged locally. The Peribit device sends ACKs to the sender at a rate governed by the speed of the link.

To avoid the TCP congestion mechanism, a reliable transport protocol ensures in-order delivery between the two Peribit devices, and provides retransmission when necessary. Congestion is managed by Peribit's outbound QoS.



**Figure 7-5 Active Flow Pipelining**

Like Flow Pipelining, AFP is intended for applications that do large data transfers. In general, AFP improves performance if the product of the effective bandwidth and latency (the maximum window size) exceeds the TCP window size. Note that 64 KB is the typical TCP window size for Windows 2000 and later. However, for Windows 98, the TCP window size is 16 KB.

For example, on a T1 link (1.5 Mbps) where the latency is 200 ms, and a 50% data reduction doubles the effective bandwidth, the maximum window size is:

$$(3,088,000 \text{ bps} * 0.200 \text{ seconds})/8 = 77,200 \text{ bytes}$$

In this case, AFP will improve performance if the host's TCP window size is 64 KB or less. Note the difference between AFP and Flow Pipelining. Flow Pipelining provides a benefit here only if the TCP window size is less than 64 KB.

The same performance metrics are used for both Flow Pipelining and AFP. On a given path between two Peribit devices, AFP may also benefit from Forward Error Correction (see below), but AFP cannot be used simultaneously with Flow Pipelining or Fast Connection Setup.

## Forward Error Correction

Forward Error Correction (FEC) enables the sending Peribit device to send recovery packets along with all data packets, so that the receiving device can reconstruct lost packets without requesting a retransmission. You can specify the number of recovery packets per block of data packets.

FEC is intended for use in high-loss, high-latency environments, such as satellite connections. If Active Flow Pipelining is enabled for a remote Peribit device, FEC is enabled by default. However, FEC should be disabled if the satellite modem also provides forward error correction. Note that when FEC is enabled for a Peribit device, recovery packets are generated for all traffic sent to that device.

After you enable FEC, check the monitoring report periodically. If losses are not persistent, disable FEC to avoid the extra overhead required to process recovery packets.

## Requirements for Using Packet Flow Acceleration

To accelerate application traffic between two Peribit devices, the following conditions must be met:

- The applications must be reduced (refer to [“Reducing and Monitoring Applications” on page 130](#)).
- A reduction tunnel must exist in both directions between the Peribit devices (refer to [“Configuring Endpoints for Reduction Tunnels” on page 123](#)).
- Outbound QoS must be enabled using Weighted Fair Queuing or Weighted Strict Priority, and the WAN circuit speed must be specified for each remote Peribit device for which you want to accelerate traffic (refer to [“Using Outbound QoS to Enhance Performance” on page 145](#)).
- To use Active Flow Pipelining on a mesh or hub device, select the next highest range of devices, if possible (refer to [“Setting Community Topology Parameters” on page 97](#)).
- For Flow Pipelining and Active Flow Pipelining, all application traffic must traverse the same two Peribit devices in both directions. If the return traffic does not come back through the receiving device, packet acceleration will be ineffective.

To verify that traffic is traversing the same devices in both directions, check the sent and received packet counts in the Top Flows traffic report (refer to [“Viewing and Exporting Top Traffic Statistics” on page 222](#)).

---

**NOTE:** PFA is most effective in networks with high-speed connections and high latency. However, PFA may have no effect if the traffic must cross low-speed or high-latency connections that are one or more hops beyond the receiving Peribit device.

---

## Defining Outbound QoS Settings for PFA

You must enable outbound QoS and specify the WAN circuit speed for each remote Peribit device for which you want to accelerate traffic. If the circuit speeds are specified incorrectly, too much data may be sent to the router, and the acceleration reports may show performance gains that cannot be realized due to router congestion.

If you do not need all the features of outbound QoS, such as traffic classes and guaranteed bandwidths, specify the aggregate WAN speed for the current device and the circuit speed for each of the remote Peribit devices, and then enable outbound QoS by selecting Weighted Fair Queuing or Weighted Strict Priority bandwidth allocation (refer to [“Using Outbound QoS to Enhance Performance” on page 145](#)).

## Enabling Packet Flow Acceleration by Endpoint

You can enable each method of Packet Flow Acceleration for all remote Peribit devices (endpoints), or for specific endpoints. Active Flow Pipelining must be enabled on both the sending and receiving devices. For other methods, if most of the traffic is in one direction, you can enable just the sending device. To enable acceleration for a remote endpoint, you must:

- Enable reduction tunnels in both directions between the Peribit devices (refer to [“Configuring Endpoints for Reduction Tunnels” on page 123](#)).
- Enable outbound QoS using Weighted Fair Queuing or Weighted Strict Priority, and specify the WAN circuit speed for the remote endpoint (refer to [“Defining Outbound QoS Settings for PFA” on page 182](#)).

If you enable Flow Pipelining, Active Flow Pipelining, or Fast Connection Setup, you must also select the applications that each method is applied to (refer to [“Enabling Flow Pipelining by Application” on page 186](#)).

To enable Packet Flow Acceleration by endpoint:

1. Verify that reduction tunnels exist in both directions between the Peribit devices that you want to support Packet Flow Acceleration (refer to [“Configuring Endpoints for Reduction Tunnels” on page 123](#)).

2. Click **ACCELERATION** in the menu frame.

**Peribit-SR** peribit

SETUP REDUCTION QOS **ACCELERATION** MONITOR ADMIN HELP Logged in as: admin SAVE LOGOUT

**Acceleration**

OVERVIEW

APPLICATION FILTERS

- Flow Pipelining
- Fast Connection Setup
- Active Flow Pipelining

**Packet Flow Acceleration Overview** HELP

**STEP 1: Enable desired Acceleration capabilities:**

☒ Flow Pipelining ☐ Fast Connection Setup ☒ Active Flow Pipelining ☒ Forward Error Correction

**STEP 2: Specify how enabled Acceleration capabilities are applied to endpoints:**

☐ Accelerate all QoS enabled endpoints using default settings

☒ Accelerate checked endpoints using custom settings

Endpoint	Name	Standard	High-Latency	Flow Pipelining	Fast Connection Setup	Active Flow Pipelining	Forward Error Correction	Recovery Packets	Data Packets
<input type="checkbox"/> 192.168.53.5	53/5-50	<input checked="" type="radio"/>	<input type="radio"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
<input type="checkbox"/> 192.168.55.100	55/100-SR20	<input checked="" type="radio"/>	<input type="radio"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
<input checked="" type="checkbox"/> 192.168.53.180	53/180-50_Pri	<input type="radio"/>	<input checked="" type="radio"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	1	9
<input checked="" type="checkbox"/> 192.168.53.179	53/180-50_Sec	<input type="radio"/>	<input checked="" type="radio"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	1	9
<input type="checkbox"/> 192.168.53.199	53/199-50	<input checked="" type="radio"/>	<input type="radio"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
<input type="checkbox"/> 192.168.55.200	55/200-SR20	<input checked="" type="radio"/>	<input type="radio"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		

(Note that QoS must be enabled on an endpoint before it can be accelerated.)

☒ Show Advanced Settings

**Figure 7-6 Enabling Packet Flow Acceleration**

- At the top of the page, select the check box next to each of the PFA methods that you want to use for one or more of the remote endpoints.
- Select one of the following options:

- **Accelerate all endpoints using default settings.** Traffic is accelerated to all remote Peribit devices for which a reduction tunnel exists and outbound QoS is configured correctly. The PFA methods you select apply to all qualifying endpoints, and to all qualifying endpoints added to the same Peribit community in the future.
- **Accelerate checked endpoints using custom settings.** Traffic is accelerated only to the selected Peribit devices, and different PFA methods can be used for each endpoint. Click the check box next to the IP address of the appropriate devices. To select all devices, click **Select All**. To deselect all devices, click **Clear**. An endpoint is greyed out if no reduction tunnel exists or outbound QoS is not configured correctly.

For Peribit devices that support Multi-Path, a “\_Pri” or “\_Sec” is appended to the device name to indicate the primary or secondary path. You can enable PFA for one or both paths. To configure Multi-Path, refer to [“Configuring Policy-Based Multi-Path” on page 113](#).

## 5. Select the PFA methods to be used for each endpoint or for all endpoints:.

Active Flow Pipelining	<p>Select <b>High-Latency</b> to enable Active Flow Pipelining and Forward Error Correction. AFP is intended for high-latency environments, such as satellite connections, and long-haul high-bandwidth links, such as E3 and T3. AFP must be enabled on both the sending and receiving device, and cannot be used simultaneously on the same path with Flow Pipelining or Fast Connection Setup.</p> <p>To enable Flow Pipelining, Fast Connection Setup, and/or Forward Error Correction, select <b>Standard</b>.</p> <p>To use AFP on a mesh or hub device, select the next highest range of devices, if possible (refer to <a href="#">“Setting Community Topology Parameters” on page 97</a>).</p> <p><b>NOTE:</b> In some cases, you may need to adjust the buffer size for optimum performance. Also, on high-loss links, data reduction may stop if consecutive heartbeat packets are lost. To adjust the buffer size or increase the number of lost heartbeat packets allowed for endpoints using Active Flow Pipelining or Forward Error Correction, refer to <a href="#">“Configure Acceleration Command” on page 262</a>.</p>
Flow Pipelining	<p>The sending Peribit device prompts the TCP source to send data faster by increasing the size of the TCP receive window to 64 KB. The receiving device stores and forwards data to the client, as needed. Intended for applications that do a large volume of data transfers, such as FTP and CIFS.</p> <p>Sessions cannot be accelerated if the TCP window scale option is enabled or if the TCP receive window is set to the maximum (64 KB). Also, network congestion may limit the receive window to less than 64 KB.</p>
Fast Connection Setup	<p>The sending device locally acknowledges session requests for destinations known to be active. Fast Connection Setup is intended for applications that have many short sessions, such as HTTP 1.0 and NetBios. Short sessions are those that last less than ten times the round-trip time (RTT).</p>
Forward Error Correction	<p>The sending device sends recovery packets with the data to minimize the number of retransmissions required when data packets are lost. By default, one recovery packet is sent for every nine data packets. When you enable Forward Error Correction, you can change the number of data and recovery packets if <b>Show Advanced Settings</b> is set at the bottom of the page.</p> <p>After you enable FEC, check the monitoring report periodically. If losses are not persistent, disable FEC to avoid the overhead required to process recovery packets.</p>
Recovery Packets and Data Packets	<p>Select the number of recovery packets (1 through 5) for the number of data packets (4 through 25). The settings should be based on the WAN error rate, as shown in Table 7-1.</p> <p>Note the following:</p> <ul style="list-style-type: none"> <li>Increasing the ratio of recovery packets to data packets reduces retransmissions, but requires more overhead.</li> <li>Data packets must be a multiple of the recovery packets. For one recovery packet, the data packets can be 4 through 25; for 2 recovery packets, the data packets can be 4, 6, 8, and so on through 24.</li> </ul>



**Table 7-1 Recommended Data and Recovery Packets for FEC**

Error Rate	Recovery Packets	Data Packets	Recovery Packet Overhead
6.25%	1	4	25%
5.00%	1	5	20%
4.25%	1	6	17%
3.50%	1	7	14%
3.00%	1	8	13%
2.75%	1	9	11%
2.50%	1	10	10%
2.25% or less	1	11	9%

6. Click **Submit** to activate the changes, or click **Reset** to discard them.
7. To retain your changes when the device is restarted, click **SAVE** in the menu frame.

---

**NOTE:** Flow Pipelining and Active Flow Pipelining are effective only when the same pair of Peribit devices handles the flow in both directions. If load balancing is enabled with these methods, it must be “Flow based” (refer to [“Configuring Load Balancing Policies” on page 133](#)).

---

You can now enable PFA for specific applications, as described in [“Enabling Packet Flow Acceleration by Application” in the next section](#).

## Enabling Packet Flow Acceleration by Application

The following topics describe how to enable specific applications for Flow Pipelining, Active Flow Pipelining, and Fast Connection Setup.

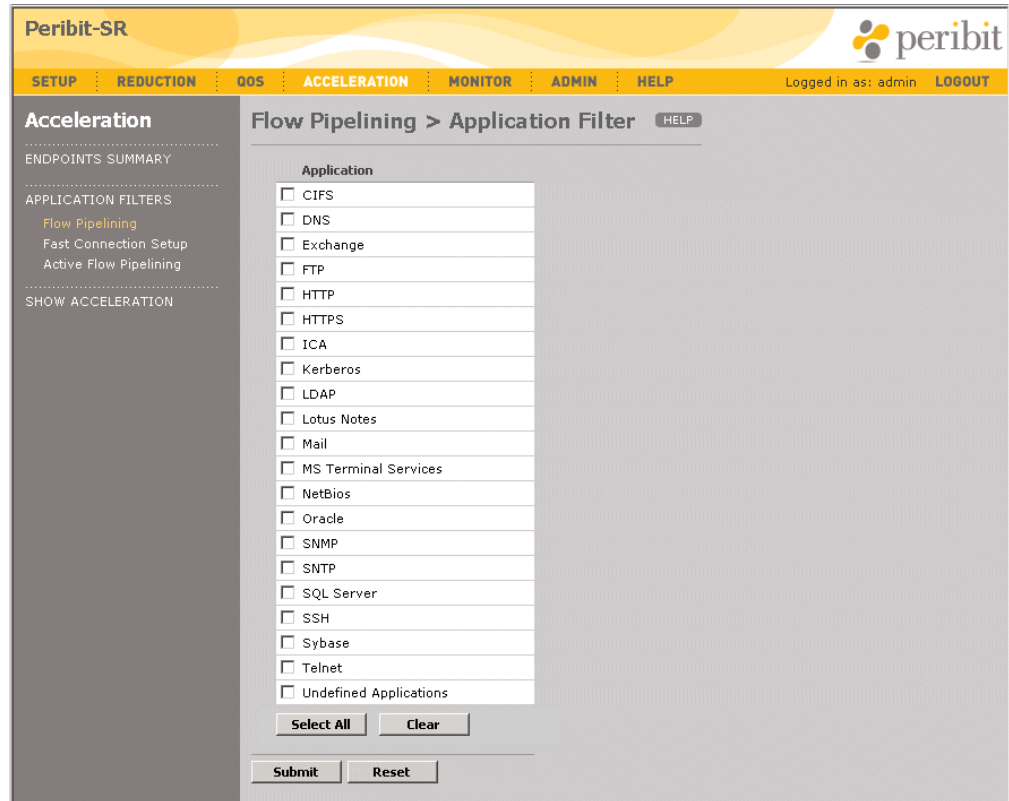
- [“Enabling Flow Pipelining by Application” on page 186](#)
- [“Enabling Fast Connection Setup by Application” on page 187](#)
- [“Enabling Active Flow Pipelining by Application” on page 188](#)

## Enabling Flow Pipelining by Application

After you enable Flow Pipelining, as described in [“Enabling Packet Flow Acceleration by Endpoint” on page 182](#), you can select the applications whose outgoing traffic you want to accelerate. Flow Pipelining is intended for applications that transfer large amounts of data, such as FTP and CIFS.

To enable Flow Pipelining for one or more applications:

1. Click **ACCELERATION** in the menu frame, and then click **Flow Pipelining** under **APPLICATION FILTERS** in the left-hand navigation frame.



**Figure 7-7 Enabling Flow Pipelining by Application**

2. Select the check box next to each application that you want to accelerate using Flow Pipelining, or click **Select All**. The selected applications are accelerated only if they are also being reduced (refer to [“Reducing and Monitoring Applications” on page 130](#)).

---

**NOTE:** To accelerate application traffic in both directions between two Peribit devices, you must enable Flow Pipelining for the application on both devices.

---

3. Click **Submit** to activate the changes, or click **Reset** to discard them.
4. To retain your changes when the device is restarted, click **SAVE** in the menu frame.

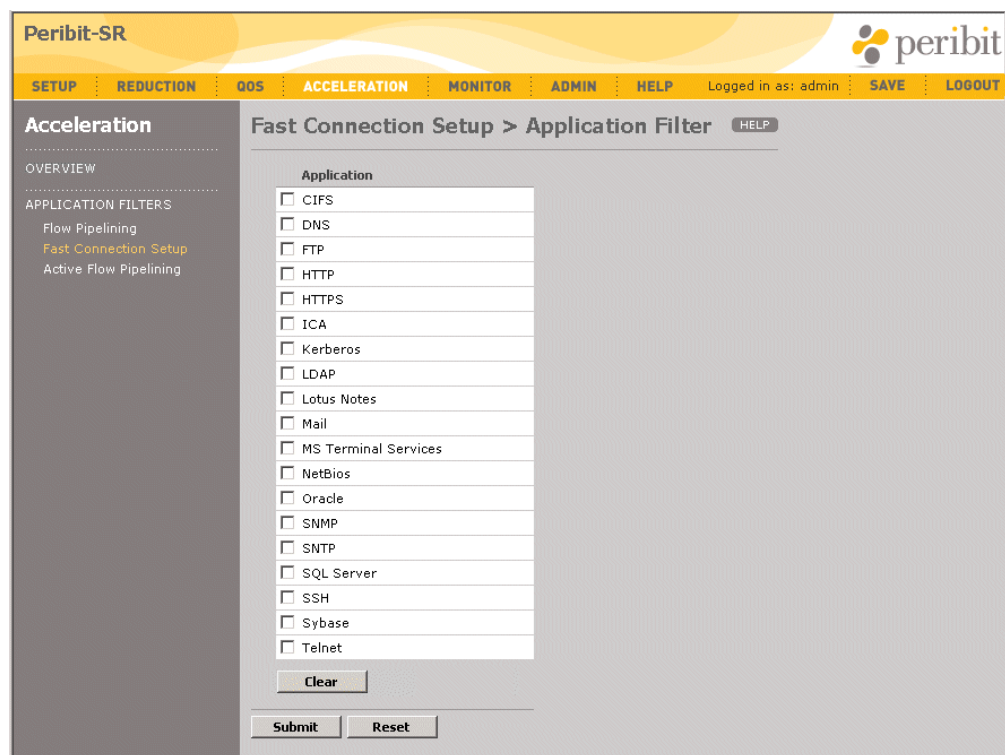
## Enabling Fast Connection Setup by Application

After you enable Fast Connection Setup, as described in [“Enabling Packet Flow Acceleration by Endpoint” on page 182](#), you can select the applications whose outgoing traffic you want to accelerate. Fast Connection Setup is intended for applications that have many short sessions, such as HTTP 1.0 and NetBios.

Short sessions are those that last less than ten times the round-trip time (RTT). If a specific application traffic flow has five consecutive short sessions, subsequent identical traffic flows are accelerated.

To enable Fast Connection Setup for one or more applications:

1. Click **ACCELERATION** in the menu frame, and then click **Fast Connection Setup** under **APPLICATION FILTERS** in the left-hand navigation frame.



**Figure 7-8 Enabling Fast Connection Setup by Application**

2. Select the check box next to each application that you want to accelerate using Fast Connection Setup. The selected applications are accelerated only if they are also being reduced (refer to [“Reducing and Monitoring Applications” on page 130](#)).

---

**NOTE:** To accelerate application traffic in both directions between two Peribit devices, you must enable Fast Connection Setup for the application on both devices.

---

3. Click **Submit** to activate the changes, or click **Reset** to discard them.
4. To retain your changes when the device is restarted, click **SAVE** in the menu frame.

## Enabling Active Flow Pipelining by Application

After you enable Active Flow Pipelining, as described in [“Enabling Packet Flow Acceleration by Endpoint” on page 182](#), you can select the applications whose outgoing traffic you want to accelerate. Active Flow Pipelining is intended for applications that transfer large amounts of data, such as FTP and CIFS, over high-latency links, such as satellite connections, and long-haul high-bandwidth links, such as E3 and T3.

To enable Active Flow Pipelining for one or more applications:

1. Click **ACCELERATION** in the menu frame, and then click **Active Flow Pipelining** under **APPLICATION FILTERS** in the left-hand navigation frame.

**Figure 7-9 Enabling Active Flow Pipelining by Application**

2. Select the check box next to each application that you want to accelerate using Active Flow Pipelining, or click **Select All**. The selected applications are accelerated only if they are also being reduced (refer to [“Reducing and Monitoring Applications” on page 130](#)).

**NOTE:** Active Flow Pipelining must be enabled on both the sending and receiving Peribit devices.

3. Click **Submit** to activate the changes, or click **Reset** to discard them.
4. To retain your changes when the device is restarted, click **SAVE** in the menu frame.

## Chapter 8 Configuring IP Security (IPSec)

---

The following sections describe how to configure IP security (IPSec) to authenticate and encrypt traffic between any pair of Peribit devices:

- [“Overview of IPSec” in the next section](#)
- [“Procedure for Configuring IPSec Policies” on page 190](#)
- [“Using the IPSec Setup Wizard” on page 191](#)
- [“Defining IPSec Settings by Endpoint” on page 195](#)
- [“Defining IPSec Templates” on page 197](#)
- [“Defining the Default IPSec Policy” on page 199](#)

### Overview of IPSec

IPSec can be used to authenticate and encrypt traffic between any pair of Peribit devices (endpoints) in the same community. Enabling IPSec allows you to:

- Compress traffic before it is encrypted (encrypted traffic cannot be compressed).
- Encrypt traffic over unprotected networks, such as the Internet.

To configure IPSec, you define templates that specify the security algorithms and key lifetimes for outgoing traffic, and then apply a template to each of the remote endpoints that act as IPSec peers. For a pair of Peribit devices to use IPSec, IPSec must be enabled on both devices, and both devices must be configured with the same pass phrase (preshared key) and security algorithms. Each device can encrypt traffic for up to 100 remote Peribit devices (the SR-15 and SR-20 are limited to two and five devices, respectively).

### Default IPSec Policy

When two Peribit devices are configured as IPSec peers, all compressed and passthrough traffic sent between them is encrypted. For passthrough traffic destined for subnets that are not served by a Peribit device, a “default IPSec policy” is provided that lets you specify, by subnet, whether the traffic is dropped and logged or sent unencrypted. Initially, the default IPSec policy allows all traffic to be sent unencrypted.

The default IPSec policy also applies to traffic between Peribit devices where IPSec is enabled, but the key negotiation has failed. Note that an IPSec-enabled device never encrypts traffic destined for a remote device where IPSec is disabled.

After you verify that IPSec is working correctly, all subnets advertised by IPSec-enabled peers should be added to the encryption-required list to avoid sending unencrypted traffic to those subnets if a remote Peribit device fails.

---

**NOTE:** If an inline Peribit device fails, all traffic is passed through without encryption. To block all traffic during a hardware failure, use a cross-over cable (rather than a straight-through cable) to connect the Peribit device to the WAN router. This works only if Ethernet auto-MDI negotiation is disabled on the router.

---

## IPSec Implementation Details

The Peribit implementation of IPSec is implemented in compliance with RFCs 2401-2409, and includes the following:

- Encryption algorithms—Advanced Encryption Standard (AES) encryption algorithm, with 128, 192, and 256 bit keys, and Triple DES (3DES)
- Authentication algorithms—HMAC/SHA-1 and HMAC/MD5
- Internet Key Exchange (IKE) protocol for dynamic key exchange
- Encapsulated Security Protocol (ESP) in transport mode used for all encrypted packets

AES with a 256 bit key and HMAC/SHA-1 authentication provides the highest security, while AES with a 128 bit key and HMAC/MD5 authentication provides the highest throughput (primarily because SHA-1 is two to three times slower than MD5). 3DES is supported for environments where AES has not been approved, but 3DES is both slower and less secure than AES, and is not recommended.

Although the IPSec protocols allow two peers to communicate using different policies, such as having Peer1 use AES to encrypt for Peer 2, while Peer 2 uses DES to encrypt for Peer 1, the Peribit implementation requires that both Peribit device use the same encryption and authentication algorithms.

Supporting IPSec allows Peribit devices to compress traffic before encrypting it (encrypted traffic cannot be compressed because it contains few recognizable patterns). Since outgoing traffic is both compressed and encrypted, 3rd party IPSec devices cannot support Peribit's implementation because they cannot decompress the traffic. However, uncompressed Peribit IPSec traffic has been validated against Cisco and Microsoft IPSec implementations to ensure IPSec compliance.

---

**NOTE:** The IPSec Authentication Header (AH) is not used, and only Diffie-Hellman Group 5 is supported.

---

## Procedure for Configuring IPSec Policies

To configure a pair of Peribit devices to support IPSec, do the following on both devices:

1. Run the Setup Wizard to create and apply the IPSec **Wizard** template to selected Peribit devices (endpoints), as described in [“Using the IPSec Setup Wizard” on page 191](#).

---

**IMPORTANT:** Each time you run the Setup Wizard the existing Wizard template is overwritten.

---

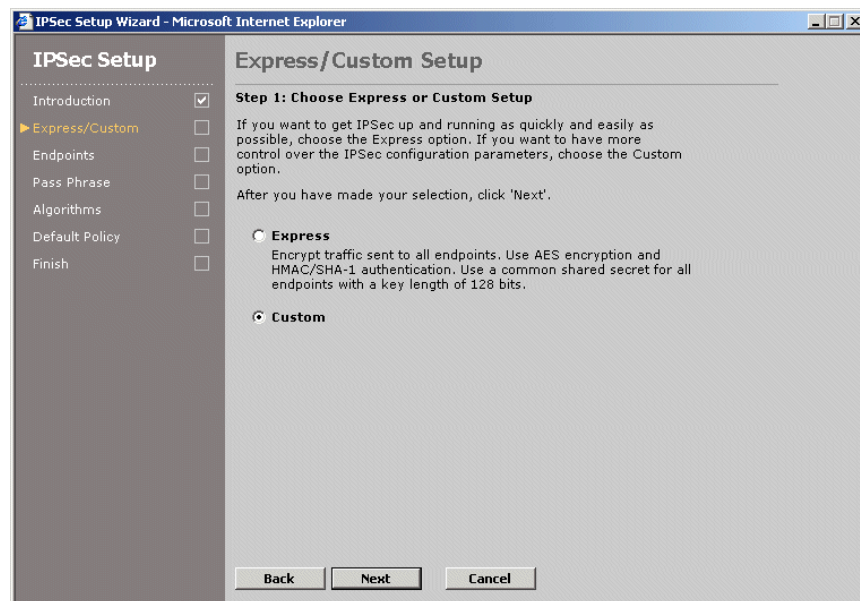
2. To change the template settings, run the Setup Wizard again (overwriting the template) or make the changes manually. The following changes must be made manually:
  - Change a template for a specific endpoint, or enable encryption for the Peribit management traffic (refer to [“Defining IPSec Settings by Endpoint” on page 195](#)).
  - Add new templates, or change a template name or key lifetimes (refer to [“Defining IPSec Templates” on page 197](#)).

## Using the IPsec Setup Wizard

Always use the Setup Wizard the first time you define the IPsec policies. The Setup Wizard creates a template called **Wizard** and applies it to the selected endpoints. Each time you run the Setup Wizard, the **Wizard** template is overwritten. To define other templates, refer to [“Defining IPsec Templates” on page 197](#).

To run the IPsec Setup Wizard:

1. In the Setup page, click **IPSEC** in the left-hand navigation frame, and then click **Setup Wizard**.
2. Click **Enable IPsec** and click **Next**.



**Figure 8-1** Selecting an Express or Custom Setup

3. Select one of the following, and click **Next**.

### Express

Applies the default Wizard template to all endpoints, and prompts you to enter a single pass phrase that applies to all endpoints (up to 64 characters). Note that assigning the same pass phrase to all endpoints is a poor security practice, and is not recommended.

The default template uses the following algorithms:

- **Encryption.** Advanced Encryption Standard with a 128-bit key (AES-128)
- **Authentication.** Secure Hash Algorithm (HMAC/SHA-1)

If you select this option, enter the pass phrase for all endpoints on the next page, and go to Step 9.

### Custom

Allows you to select specific endpoints that support IPsec, specify a separate pass phrase for each endpoint, and select the template algorithms.

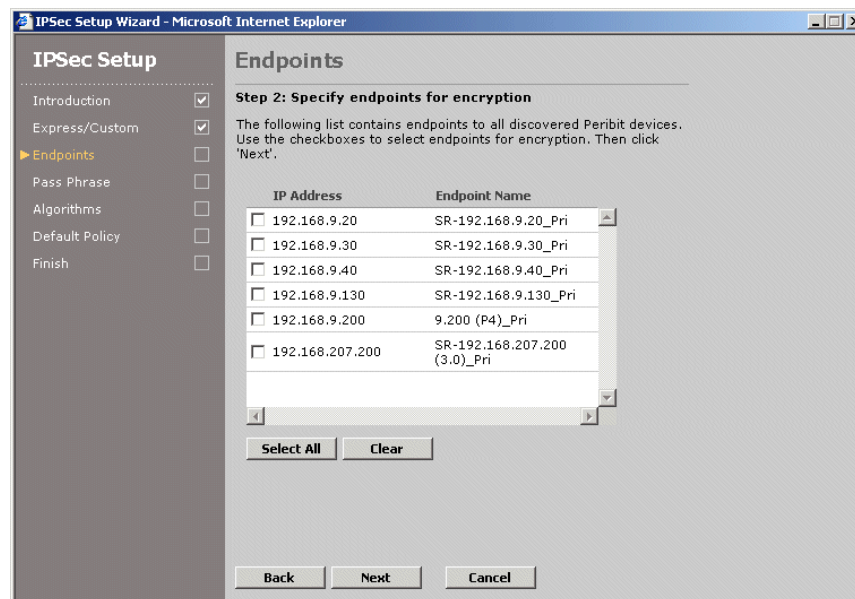


4. If you select the **Custom** setup, select one of the following, and click **Next**.

All endpoints	Enables IPSec for all remote endpoints.
Selected endpoints	Allows you to select specific endpoints that support IPSec.

5. To enable IPSec for specific endpoints, select the check box next to the IP address of the appropriate remote devices, or click **Select All**, and then click **Next**.

For Peribit devices that support Multi-Path, a “\_Pri” and “\_Sec” are appended to the device name to indicate the primary and secondary path. You can enable IPSec for one or both paths. To configure Multi-Path, refer to [“Configuring Policy-Based Multi-Path” on page 113](#).



**Figure 8-2 Configuring IPSec Endpoints**

6. Select one of the following, and click **Next**.

Common Pass Phrase	Prompts you to specify one pass phrase for all endpoints. (This is a poor security practice, and is not recommended.)
Individual Pass Phrases	Prompts you to specify a separate pass phrase for each endpoint.

The pass phrase is used to generate a preshared key of the appropriate length. The pass phrase can be from 4 to 64 four characters, but 8 characters is the recommended minimum.

7. Enter and verify a pass phrase for each endpoint or all endpoints, and click **Next**. The same pass phrase must be specified on the remote devices.



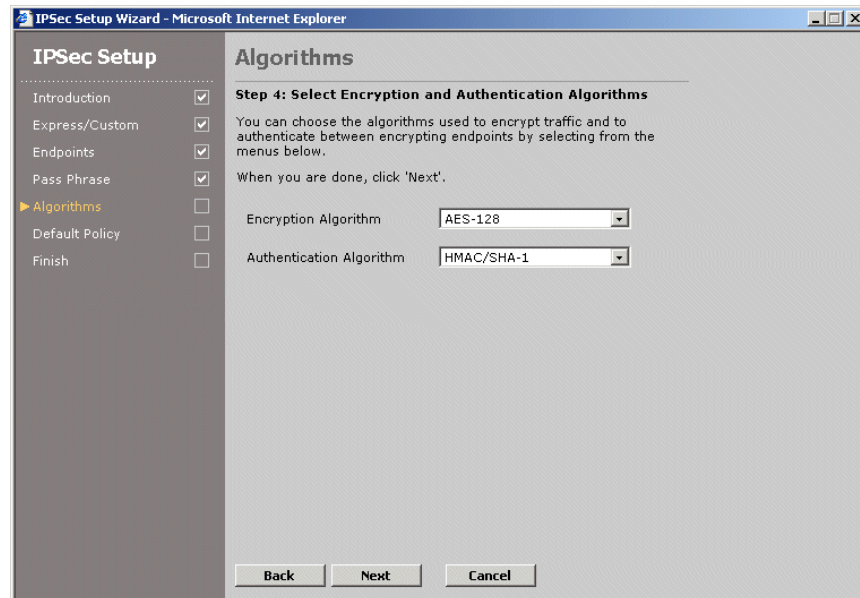
8. Select the encryption and authentication algorithms, and click **Next**.

Encryption Algorithm Select the algorithm used to encrypt outbound traffic:

- **Any**. The algorithm selected for the peer endpoint is used. If both endpoints specify **Any**, AES-128 is used.
- **AES-128**. Advanced Encryption Standard with a 128-bit key.
- **AES-192**. AES with a 192-bit key.
- **AES-256**. AES with a 256-bit key.
- **3DES**. Triple Digital Encryption Standard with a 168-bit key.

Authentication Algorithm Select the algorithm used to authenticate outbound traffic:

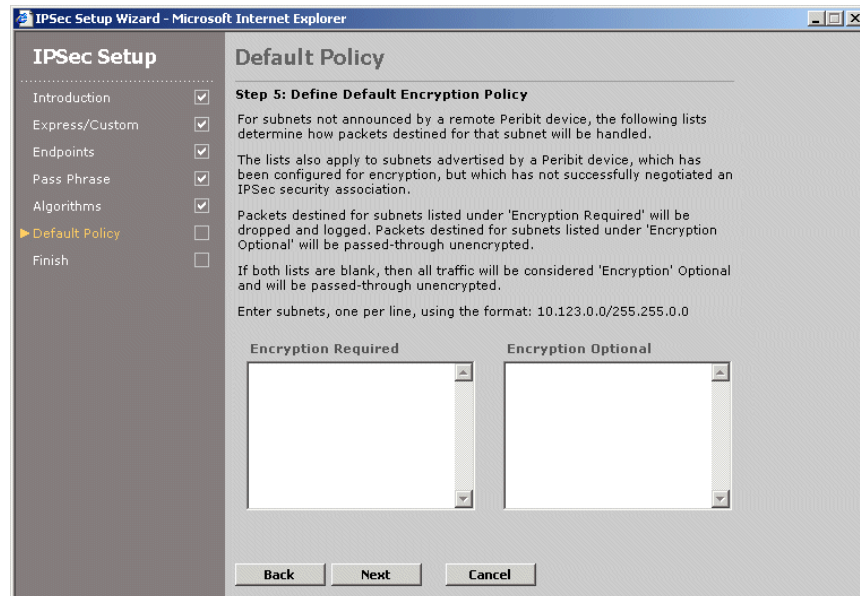
- **Any**. The algorithm selected for the peer endpoint is used. If both endpoints specify **Any**, HMAC/SHA-1 is used.
- **HMAC/SHA-1**. Secure Hash Algorithm.
- **HMAC/MD5**. Message Digest 5.



**Figure 8-3** Selecting Encryption and Authentication Algorithms

9. The default IPSec policy is applied to traffic sent to unadvertised subnets (no Peribit device) and to subnets advertised by devices where encryption is enabled, but the key negotiation has failed. By default, all such traffic is unencrypted.

After you verify that IPSec is working correctly, all subnets advertised by IPSec-enabled peers should be added to the encryption-required list to avoid sending unencrypted traffic to those subnets if a remote Peribit device fails.



**Figure 8-4 Defining the Default IPSec Policy**

Specify destination addresses and subnets where encryption is required, and click **Next**.

Encryption Required	Enter destination addresses or subnets (one per line) for which traffic must be dropped and logged. The subnet format is:  <IP address>/<subnet mask>
Encryption Optional	Enter destination addresses or subnets (one per line) for which traffic can be sent unencrypted.  For example, if subnet 10.10.0.0/255.255.0.0 is specified as encryption required, you can specify one or more smaller subnets in that range where encryption is optional, such as 10.10.20.0/255.255.255.0. If an address or subnet is in both lists, the traffic is sent unencrypted.

10. Click **Next**, click **Submit**, and then click **Close**.
11. Under **IPSEC** in the left-hand navigation frame, click **Overview** to refresh the IPSec Overview page, which now shows the template name (**Wizard**) assigned to each of the selected endpoints.
12. To retain your changes when the device is restarted, click **SAVE** in the menu frame.

You can now customize the settings for each endpoint, as described in [“Defining IPSec Settings by Endpoint”](#) in the next section.

# Defining IPSec Settings by Endpoint

After you run the Setup Wizard to create the initial IPSec settings, you can enable or disable IPSec for all endpoints or specific endpoints, change the IPSec template or pass phrase for an endpoint, or enable encryption for management traffic. You can also view the status of each secure connection. To add or change IPSec templates, refer to “[Defining IPSec Templates](#)” on [page 197](#).

**NOTE:** When the Status column indicates that IPSec is operating normally with a remote Peribit device, it is highly recommended that you enable encryption of management traffic for that device. Also, remember to save the configuration so that encryption is not lost when the device is restarted.

To view or change the IPSec settings by endpoint:

1. In the Setup page, click **IPSEC** in the left-hand navigation frame, and then click **Overview**.

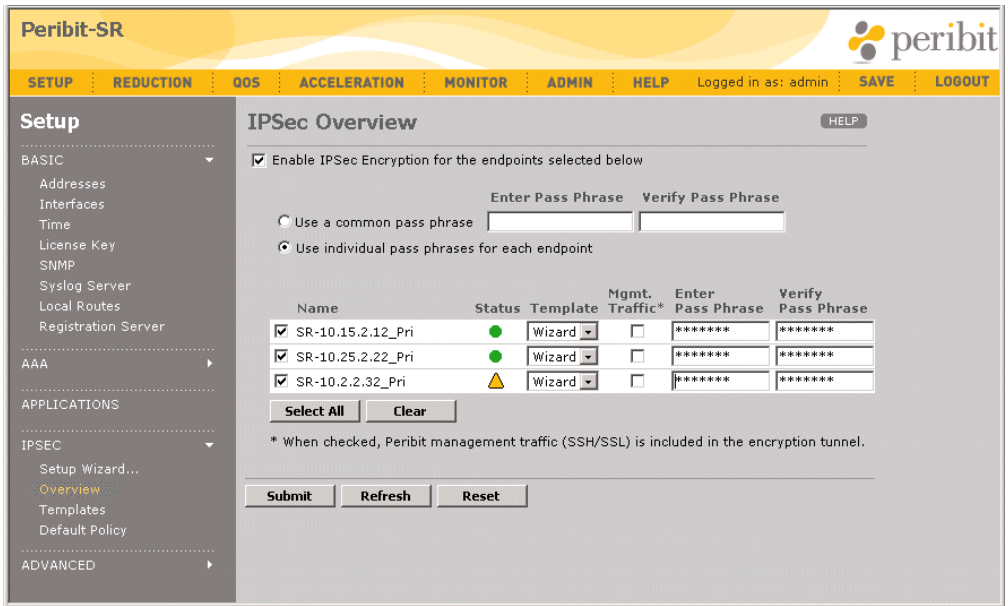


Figure 8-5 IPSec Overview

2. Do one or more of the following and click **Submit** to activate the changes, or click **Reset** to discard them.
  - To enable IPSec, click the check box next to **Enable IPSec Encryption for the endpoints selected below**. You can then enable IPSec for specific endpoints by selecting the check box next to the remote endpoints. If you disable an endpoint, all subsequent traffic to that endpoint is sent unencrypted.

For Peribit devices that support Multi-Path, a “\_Pri” and “\_Sec” are appended to the device name to indicate the primary and secondary path. You can enable IPSec for one or both paths. To configure Multi-Path, refer to “[Configuring Policy-Based Multi-Path](#)” on [page 113](#).

- To change the common pass phrase or an individual pass phrase, enter and verify the new pass phrase (4 to 64 characters, eight is recommended) in the appropriate boxes. The pass phrase is used to generate a preshared key of the appropriate length.

To switch between common and individual pass phrases, select the appropriate radio button. If you select **Use a common pass phrase**, the individual pass phrases (if any) are retained for future use (click **Use individual pass phrases** to reactivate them).

---




**NOTE:** The pass phrase specified here must match the pass phrase specified on the remote device.

---

- To change the template for an endpoint, select a template from the **Template** drop-down menu. Note that two endpoints can establish a secure connection only if their IPSec templates specify the same authentication and encryption algorithms. To create new templates, refer to [“Defining IPSec Templates” on page 197](#).
- To encrypt all management traffic sent to a remote endpoint, including SNMP, Syslog, and registration server traffic, click the **Mgmt. Traffic** check box for the endpoint. Encrypting management traffic is recommended after you verify that the IPSec connection is operating normally.

3. Click **Refresh** to update the icons in the **Status** column. The following icons are used to indicate the status of each IPSec connection:

**Table 8-1 IPSec Icon Descriptions**

Icon	Description
	<b>Normal operation</b> — A secure connection is established between this device and the remote device.
	<b>Configuration change</b> — New inbound and outbound security associations (SAs) are being negotiated due to a configuration change. Each SA specifies the algorithms and generated keys used to protect traffic in one direction.  If this icon is displayed for more than a minute or two, the negotiation has failed and the old security association will eventually expire.
	<b>No security association</b> — A security association has not been negotiated. The default IPSec policy is applied to all traffic sent to this endpoint (refer to <a href="#">“Defining the Default IPSec Policy” on page 199</a> ).

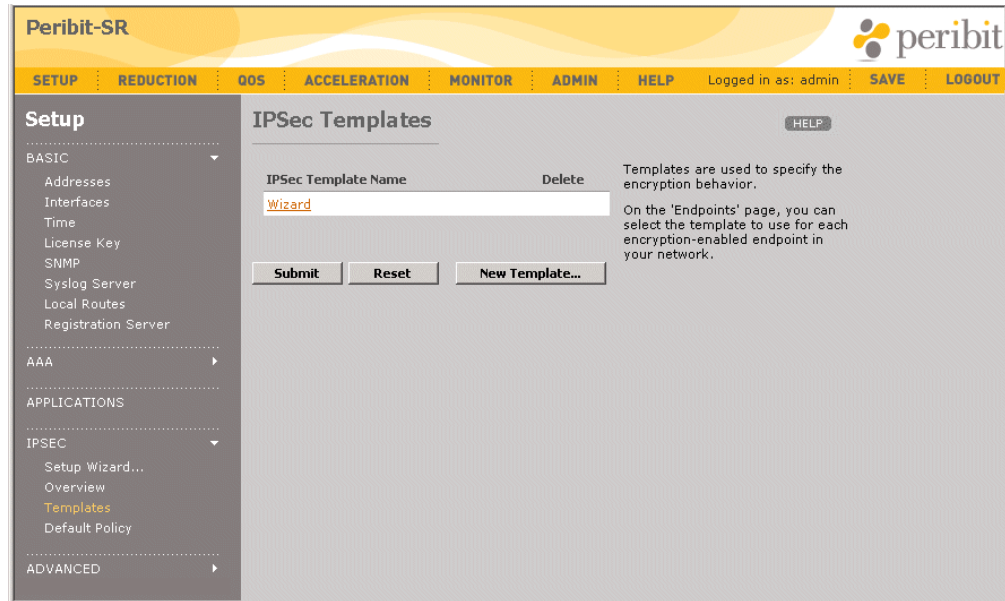
4. To retain your changes when the device is restarted, click **SAVE** in the menu frame.

## Defining IPSec Templates

IPSec templates specify the algorithms used to protect traffic between endpoints, and the lifetime of each generated key. You can change the template created by the Setup Wizard or create new templates. To apply a template to an endpoint, refer to [“Defining IPSec Settings by Endpoint” on page 195](#).

To define IPSec templates:

1. In the Setup page, click **IPSEC** in the left-hand navigation frame, and then click **Templates**.



**Figure 8-6 Defining IPSec Templates**

From the IPSec Templates page, you can:

- Add a new template, as described in Step 2 through Step 4.
- Change a template name or settings. Click the template name, change the template name and/or the settings, and click **Submit**.
- Delete a template. Click the check box next to the template name, and click **Submit**. If the deleted template is applied to an endpoint, the endpoint reverts to the Wizard template. The Wizard template can be changed, but not deleted.

2. To add a new template, click **New Template**.

**Figure 8-7 Defining a New IPSec Template**

3. Enter the following information:

Template Name	Enter the name of the template (up to 20 characters).
Encryption Algorithm	<p>Select the algorithm used to encrypt outbound traffic:</p> <ul style="list-style-type: none"> <li>• <b>Any</b>. The algorithm selected for the peer endpoint is used. If both endpoints specify <b>Any</b>, AES-128 is used.</li> <li>• <b>AES-128</b>. Advanced Encryption Standard with a 128-bit key.</li> <li>• <b>AES-192</b>. AES with a 192-bit key.</li> <li>• <b>AES-256</b>. AES with a 256-bit key.</li> <li>• <b>3DES</b>. Triple Digital Encryption Standard with a 168-bit key.</li> </ul>
Authentication Algorithm	<p>Select the algorithm used to authenticate outbound traffic:</p> <ul style="list-style-type: none"> <li>• <b>Any</b>. The algorithm selected for the peer endpoint is used. If both endpoints specify <b>Any</b>, HMAC/SHA-1 is used.</li> <li>• <b>HMAC/SHA-1</b>. Secure Hash Algorithm.</li> <li>• <b>HMAC/MD5</b>. Message Digest 5.</li> </ul>
Key Lifetime	<p>Specify the time and data limits for generated keys:</p> <ul style="list-style-type: none"> <li>• <b>Time</b>. Enter the number of hours before a generated key expires (up to 2160), or select <b>Never expires</b>.</li> <li>• <b>Data</b>. Enter the number of megabytes of traffic allowed before a generated key expires (up to 4000), or select <b>Never expires</b>.</li> </ul> <p>Key negotiation begins when the key lifetime reaches 80% of the time limit or 50% of the data limit. Keys should be negotiated periodically for security purposes.</p>

4. Click **Submit** to activate the changes, or click **Reset** to discard them.
5. To retain your changes when the device is restarted, click **SAVE** in the menu frame.

## Defining the Default IPSec Policy

The default IPSec policy is applied to the following types of traffic:

- Passthrough traffic sent to unadvertised subnets (no remote Peribit device)
- Traffic between Peribit devices where IPSec is enabled, but the key negotiation has failed

By default, all such traffic is unencrypted. However, you can change the default policy so that traffic to specific destinations is dropped and logged, rather than sent unencrypted. The number of packets dropped for each destination is written to the system log every five minutes. To view the system log, refer to [“Viewing and Saving System Logs” on page 240](#).

After you verify that IPSec is working correctly, all subnets advertised by IPSec-enabled peers should be added to the encryption-required list to avoid sending unencrypted traffic to those subnets if a remote Peribit device fails.

---

**NOTE:** All passthrough traffic between IPSec-enabled devices is encrypted. For example, traffic is encrypted even when reduction is disabled.

---

To change the default IPSec policy:

1. In the Setup page, click **IPSEC** in the left-hand navigation frame, and then click **Default Policy**.

**Peribit-SR**

SETUP REDUCTION QOS ACCELERATION MONITOR ADMIN HELP Logged in as: admin SAVE LOGOUT

**Setup**

BASIC

- Addresses
- Interfaces
- Time
- License Key
- SNMP
- Syslog Server
- Local Routes
- Registration Server

AAA

APPLICATIONS

IPSEC

- Setup Wizard...
- Overview
- Templates
- Default Policy**

ADVANCED

**IPSec Default Policy** HELP

For subnets not announced by a remote Peribit device, the following lists determine how packets destined for that subnet will be handled.

The lists also apply to subnets advertised by a Peribit device, which has been configured for encryption, but which has not successfully negotiated an IPSec security association.

Packets destined for subnets listed under 'Encryption Required' will be dropped and logged. Packets destined for subnets listed under 'Encryption Optional' will be passed-through unencrypted.

If both lists are blank, then all traffic will be considered 'Encryption' Optional and will be passed-through unencrypted.

Enter subnets, one per line, using the format: 10.123.0.0/255.255.0.0

**Encryption Required**

**Encryption Optional**

Submit Reset

**Figure 8-8** Defining the IPSec Default Policy

2. In the two text boxes, specify the destination addresses and subnets where encryption is required or optional, as follows:

Encryption Required	Enter destination addresses or subnets (one per line) for which traffic must be dropped and logged. The subnet format is:  <IP address>/<subnet mask>
Encryption Optional	Enter destination addresses or subnets (one per line) for which traffic can be sent unencrypted.  For example, if subnet 10.10.0.0/255.255.0.0 is specified as encryption required, you can specify one or more smaller subnets in that range where encryption is optional, such as 10.10.20.0/255.255.255.0. If an address or subnet is in both lists, or in neither list, the traffic is not encrypted.

3. Click **Submit** to activate the changes, or click **Reset** to discard them.
4. To retain your changes when the device is restarted, click **SAVE** in the menu frame.



## Chapter 9 Viewing Results

This chapter describes how to view statistics for data reduction, bandwidth utilization, application acceleration, and overall traffic statistics. It covers the following topics:

- “Viewing and Printing Reports” in the next section
- “Reduction Statistics” on page 202
- “Multi-Path Performance” on page 212
- “Outbound Bandwidth Statistics” on page 214
- “Inbound Bandwidth Statistics” on page 215
- “Application Acceleration Statistics” on page 217
- “Viewing and Exporting Top Traffic Statistics” on page 222
- “Endpoints Summary” on page 224

### Viewing and Printing Reports

Use the following methods to view additional details about report charts and graphs:

- Move the cursor over a bar chart, pie chart, or line graph to view the numerical values associated with each point on the chart or graph. Moving the cursor over the legend next to a pie chart has the same effect (clicking the legend highlights the corresponding wedge).
- On line graphs, move the cursor over a legend below the graph, such as **Data Out**, to show the y-axis values for all the associated points on the graph (Figure 9-1). Also, selecting the legend highlights the line on the graph.
- Click and drag the Zoom Scroller to the right of each line graph to zoom in on a portion of the graph. For example, to focus on the lower part of the graph, click the top of the Zoom Scroller and drag to the bottom (Figure 9-1).

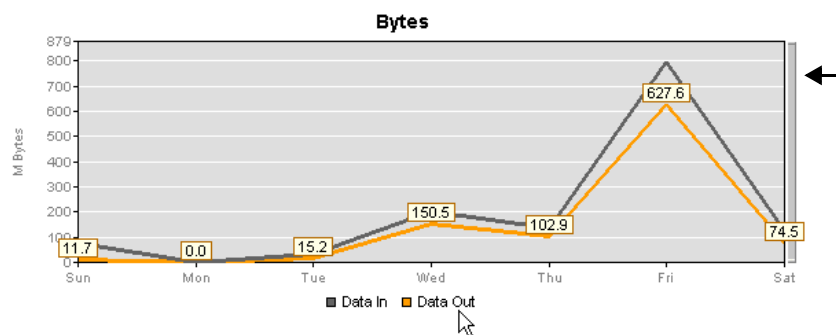


Figure 9-1 Viewing Graph Details

- To view statistics for only prime time hours (if any), select **Show Prime Time Only** in the left-hand navigation frame, and click **Submit**. The selected report time period must be a day or longer. To set the prime time hours, refer to [“Defining the Prime Time” on page 103](#).
- To print a report, select **Printer Friendly Format** in the left-hand navigation frame and click **Submit**. The report opens in a new browser window, and you can use the browser’s Print function to print the report.

## Reduction Statistics

This section describes the reduction statistics displayed in the SRS Web console. There are four types of reduction statistics:

- [“Throughput Statistics” in the next section](#)
- [“Data Reduction Statistics” on page 204](#)
- [“Application Summary Statistics” on page 207](#)
- [“Passthrough Statistics” on page 209](#)
- [“Packet Size Distribution Statistics” on page 211](#)

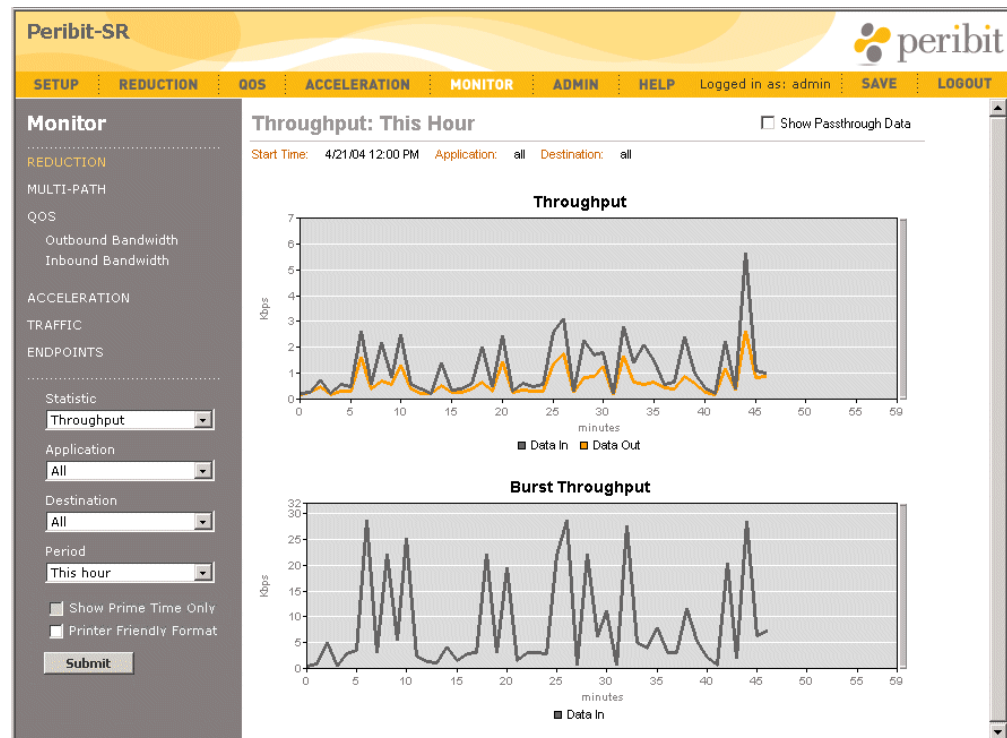
### Throughput Statistics

The throughput statistics include a Throughput line graph and a Burst Throughput line graph. The Burst Throughput graph is shown only when you view the data for all applications and destinations. These statistics help you gauge the speed of traffic in and out of the device.

To view throughput statistics:

1. Click **MONITOR** in the menu frame.
2. Select **Throughput** from the **Statistic** menu, change one or more of the following report parameters, and click **Submit**.
  - Select a monitored application from the **Application** menu. Select **Others** to view statistics for applications that are undefined or unmonitored. The default is **All**. To specify the monitored applications, refer to [“Reducing and Monitoring Applications” on page 130](#).
  - Select the IP address of a specific Peribit device from the **Destination** menu to view statistics only for traffic sent to the selected device. The default is **All**.
  - Select a time period from the **Period** menu. You can select the current or previous hour, day, week, or month. The default is **This hour**.

The Throughput page opens (Figure 9-2).



**Figure 9-2 Throughput Statistics**

3. Review the following information on the two throughput graphs. Keep in mind that all values are for the selected application, destination, and time period.
  - The Throughput graph shows the following:
    - **Data In** (grey line). Average data throughput into the reduction engine.
    - **Data Out** (orange line). Average data throughput out of the reduction engine.
    - **Data In + Passthrough** (blue line). If **All** is selected from the **Application** and **Destination** menus, click the **Show Passthrough Data** check box at the top of the page to view the total average throughput into the device, including data that is passed through without being reduced.
  - If **All** is selected from the **Application** and **Destination** menus, the Burst Throughput graph is displayed with the following:
    - **Data In** (grey line). Peak data throughput into the reduction engine. Based on five-second intervals for hourly reports, one-minute-intervals for daily reports, and one-hour intervals for weekly and monthly reports.
    - **Data In + Passthrough** (blue line). Click the **Show Passthrough Data** check box at the top of the page to view the peak throughput into the device, including data that is passed through without being reduced.

---

**NOTE:** The passthrough data shown here does not include the L2 multicast traffic. To view a breakdown of the passthrough traffic, including the amount of L2 multicast traffic, refer to [“Passthrough Statistics” on page 209](#).

---

## Data Reduction Statistics

The data reduction statistics include a Summary table, a Percent Reduction graph, a Bytes graph, and a Packets graph. The Packets graph is shown only when you view the data for all applications. You can also view a details page that shows the percentage of data reduction achieved for the traffic sent to each of the other Peribit devices.

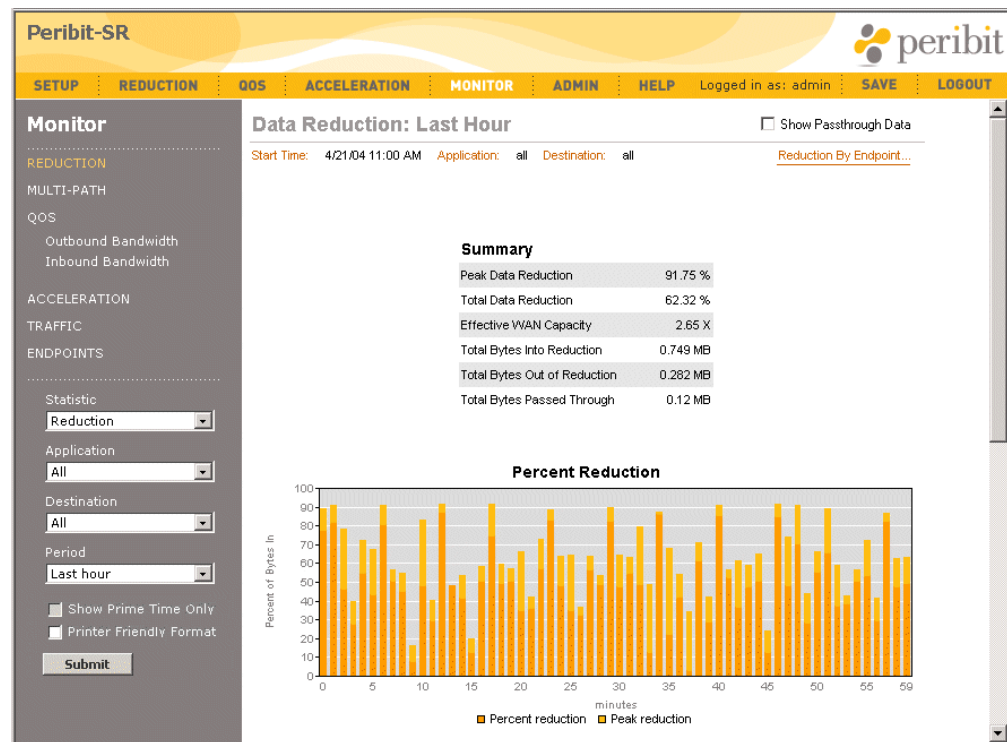
Note that the percentage of data reduction is not an average, but is based on the total number of bytes in and out of each device, as follows:

$$\% \text{ of Reduction} = \left( \frac{\text{Bytes In} - \text{Bytes Out}}{\text{Bytes In}} \right) \times 100$$

To view data reduction statistics:

1. Click **MONITOR** in the menu frame.
2. Select **Reduction** from the **Statistic** drop-down menu, change one or more of the following report parameters, and click **Submit**.
  - Select a monitored application from the **Application** menu. Select **Others** to view statistics for applications that are undefined or unmonitored. The default is **All**. To specify the monitored applications, refer to [“Reducing and Monitoring Applications” on page 130](#).
  - Select the IP address of a specific device from the **Destination** menu to view statistics only for traffic sent to the selected device. The default is **All**.
  - Select a time period from the **Period** menu. You can select the current or previous hour, day, week, or month. The default is **This hour**.

The Data Reduction page opens (Figure 9-3).



**Figure 9-3 Data Reduction Statistics**

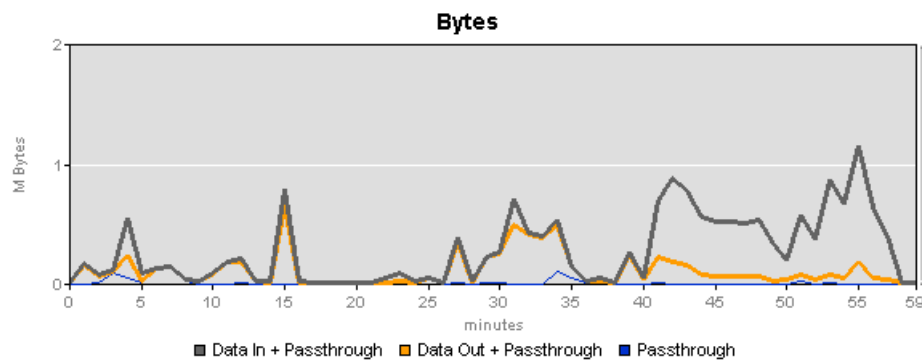
3. Review the following information on the data reduction graphs. Keep in mind that all values are for the selected application, destination, and time period.
  - The Data Reduction Summary table shows the following if **All** is selected from the **Destination** menu.
    - **Peak Data Reduction.** Highest percentage of data reduction for the selected time period. Based on five-second intervals for hourly reports, one-minute-intervals for daily reports, and one-hour intervals for weekly and monthly reports.
    - **Total Data Reduction.** Percentage of reduced data for the selected time period.
    - **Effective WAN Capacity.** Factor increase in WAN capacity resulting from the total data reduction. For example, this value is 2.00 if total data reduction is 50%.
    - **Total Bytes Into Reduction.** Number of bytes into the data reduction engine
    - **Total Bytes Out of Reduction.** Number of bytes after data reduction.
    - **Total Bytes Passed Through.** Number of bytes passed through without reduction. Data eligible for reduction may be passed through when the device is overloaded.

**NOTE:** If a specific device is selected from the **Destination** menu, the Summary table shows the total data reduction and the number of bytes in and out of the selected device, and for all devices in the community.

- If **All** is selected from the **Application** and **Destination** menus, click **Reduction By Endpoint** at the top of the page to view the data reduction for the traffic sent to each remote Peribit device. Note that historical data is maintained for at least two months, so devices may be listed that have no data for the selected time period.

Click a device name to view the data reduction by application for the device (to view the application statistics for all endpoints, refer to [“Application Summary Statistics”](#) on page 207).

- The Percent Reduction graph shows how the average and peak percentage of data reduction varied over the selected time period. Peak reduction is shown only for all applications.
- The Bytes graph shows the number of megabytes in and out of the device (Figure 9-4).



**Figure 9-4 Data Reduction Bytes Graph**

The Bytes graph includes the following:

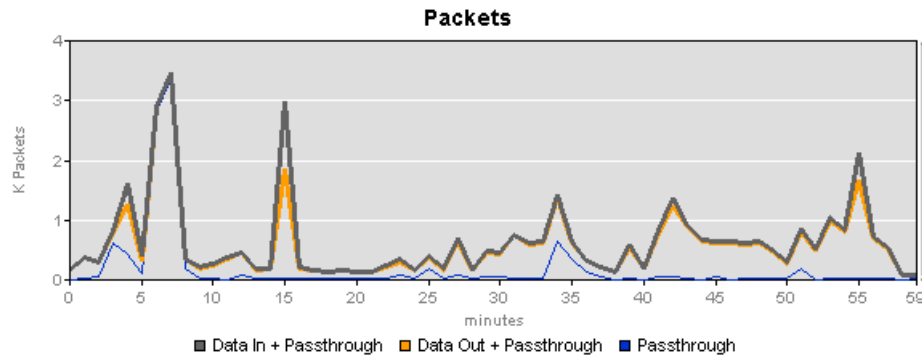
- **Data In** (grey line). Number of bytes into the reduction engine.
- **Data Out** (orange line). Number of bytes out of the reduction engine.
- If **All** is selected from the **Application** and **Destination** menus, click the **Show Passthrough Data** check box at the top of the page to add a blue **Passthrough** line that shows the number of megabytes that are passed through the device without being reduced. The passthrough values are also added to the **Data In** and **Data Out** lines.

---

**NOTE:** The passthrough data shown here does not include the L2 multicast traffic. To view a breakdown of the passthrough traffic, including the amount of L2 multicast traffic, refer to [“Passthrough Statistics”](#) on page 209.

---

- If **All** is selected from the **Application** menu, the Packets graph is displayed. The Packets graph is similar to the Bytes graph, except that it shows the number of packets in and out of the device (Figure 9-5).



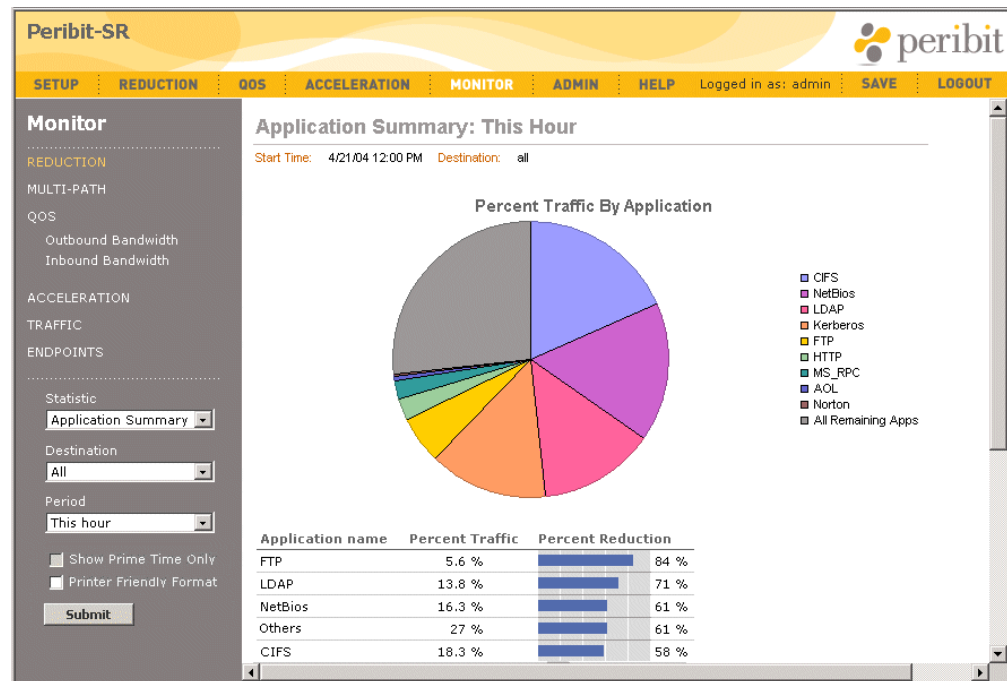
**Figure 9-5 Data Reduction Packets Graph**

## Application Summary Statistics

The Application Summary shows a pie chart of the nine monitored applications that have the highest percentage of the traffic into the Peribit device. A table is also included that shows the traffic statistics and percentage of data reduction for each monitored application (up to 40). To specify the monitored applications, refer to [“Reducing and Monitoring Applications” on page 130](#).

To view application summary statistics:

1. Click **MONITOR** in the menu frame.
2. Select **Application Summary** from the **Statistic** drop-down menu, change one or more of the following report parameters, and click **Submit**.
  - Select the IP address of a specific device from the **Destination** menu to view statistics only for traffic sent to the selected device. The default is **All**.
  - Select a time period from the **Period** menu. You can select the current or previous hour, day, week, or month. The default is **This hour**.



**Figure 9-6 Application Summary Statistics**

- Review the following information on the Application Summary. Keep in mind that all values are for the selected destination and time period.
  - The pie chart shows the nine monitored applications with the highest percentage of the total traffic into the device for the selected destination. The **All Remaining Apps** category shows the traffic for all other applications (both defined and undefined).
  - The application table has the following columns.
    - Application Name.** Names of the monitored applications, sorted in descending order by reduction percentage. The **Others** category indicates the traffic for reduced applications that are undefined or unmonitored. You can use the Top Traffic report to create definitions for the undefined applications that have the most traffic (refer to [“Viewing and Exporting Top Traffic Statistics”](#) on page 222).
    - Percent Traffic.** Percentage of the total traffic into the device’s reduction engine for each application.
    - Percent Reduction.** Percentage of data reduction achieved for each application. A dash is shown for applications that have no traffic or cannot be reduced (such as encrypted applications). Data reduction should be disabled for applications that consistently show little or no reduction (refer to [“Reducing and Monitoring Applications”](#) on page 130).



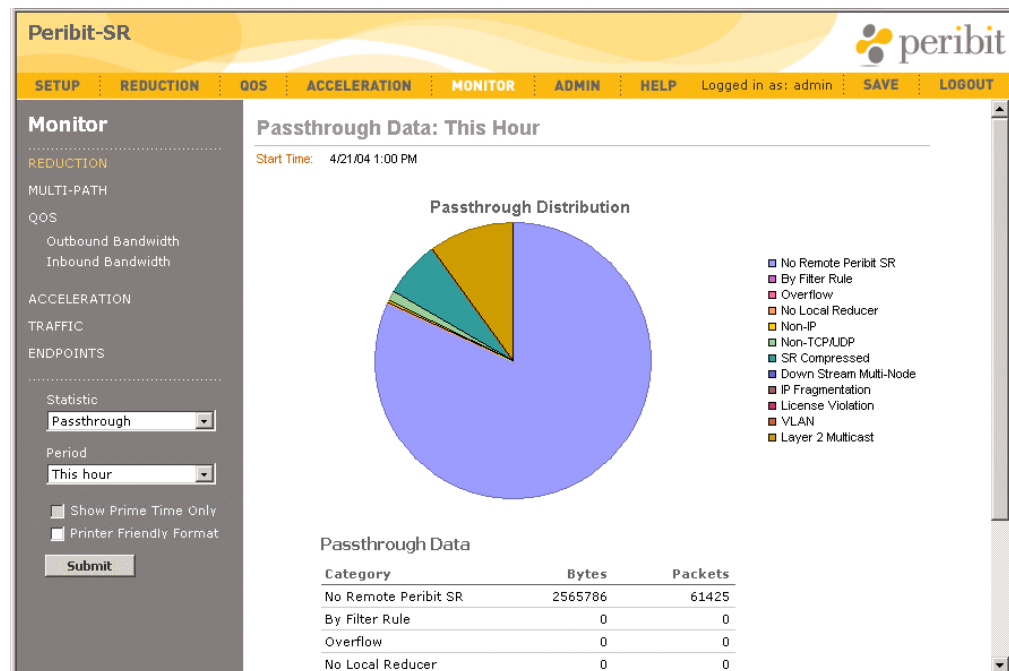
## Passthrough Statistics

Traffic that falls into one of several categories is passed through the Peribit device with no attempt at data reduction. The Passthrough report shows a pie chart of the percentage of passthrough traffic in each category. A table is also included that shows the number of bytes and packets in each category.

**NOTE:** There are no passthrough statistics for an off-path device where RIP is used to route traffic to the device. All traffic is sent through the reduction tunnel.

To view passthrough statistics:

1. Click **MONITOR** in the menu frame.
2. Select **Passthrough** from the **Statistic** drop-down menu.
3. Select a time period for the report, and click **Submit**.



**Figure 9-7 Passthrough Statistics**

The following table describes the passthrough categories.

Category	Description
No Remote Peribit SR	No Peribit device available to assemble the data, or reduction is disabled for one or more devices.
By Filter Rule	Reduction is disabled for specific applications or source/destination addresses (refer to <a href="#">“Reducing and Monitoring Applications” on page 130</a> and <a href="#">“Filtering Data Reduction by Source and Destination” on page 100</a> ).
Overflow	Traffic volume exceeded the device capacity.
No Local Reducer	Reduction is disabled on this device (refer to <a href="#">“Configuring End-points for Reduction Tunnels” on page 123</a> ).
Non-IP	Non-IP traffic is not reduced.
Non-TCP/UDP	By default, only TCP/UDP application traffic is reduced. This category is invalid if you define non-TCP/UDP applications.
SR Compressed	Traffic was compressed by another Peribit device.
Down Stream Multi-Node	Traffic will be reduced by the next Peribit device (refer to <a href="#">“Multi-Node Configurations” on page 315</a> ).
IP Fragmentation	Always zero unless reduction of IP fragments is disabled (refer to <a href="#">“Configure Filter Command” on page 270</a> ).
License Violation	The licensed throughput speed was exceeded.
VLAN	Total VLAN traffic that was not reduced for any reason. Includes traffic between local VLANs (non-WAN traffic).
Layer 2 Multicast	Layer 2 multicast traffic, such as for ARP, is not reduced because the intended destination is unknown.

## Packet Size Distribution Statistics

The Packet Size Distribution report shows the number of packets in and out of the reduction engine, the percentage reduction in the number of packets, and the number of packets in each of six packet-size ranges.

To view packet size distribution statistics:

1. Click **MONITOR** in the menu frame.
2. Select **Packet Distribution** from the **Statistic** drop-down menu.
3. Select a time period from the **Period** menu and click **Submit**. You can select the current or previous hour, day, week, or month. The default is **This hour**.

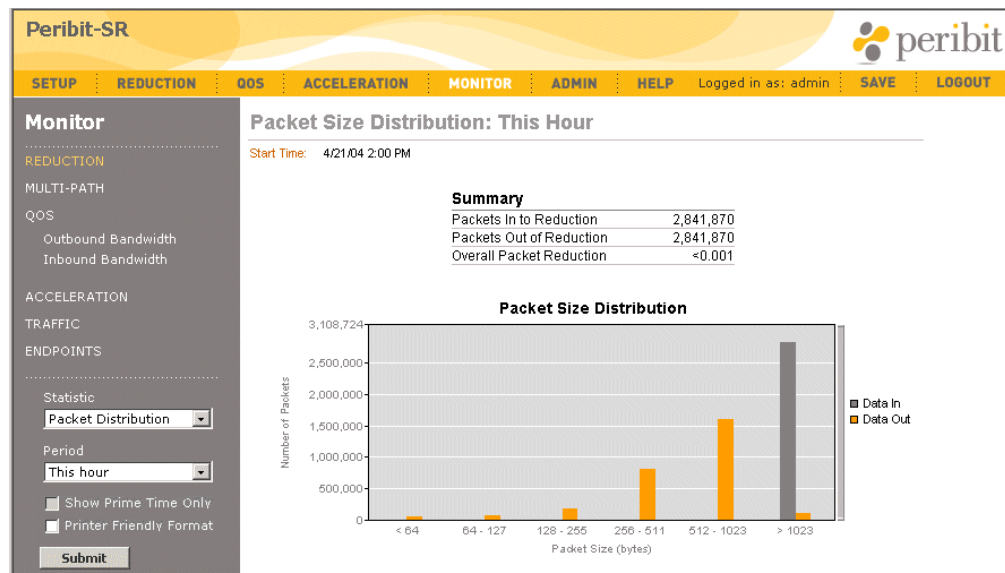


Figure 9-8 Packet Size Distribution Statistics

## Multi-Path Performance

If Multi-Path is enabled on the current Peribit device, the Multi-Path report shows the performance of the primary and secondary paths for outbound traffic to a selected endpoint. The Multi-Path report charts show the round-trip time (latency) and percentage of Peribit probes lost (not traffic loss) for the primary and secondary paths.

The Latency chart indicates where traffic is diverted to the alternate path when the loss or latency thresholds are exceeded, or when the reduction tunnel fails. To configure multi-path thresholds and other settings, refer to [“Configuring Policy-Based Multi-Path” on page 113](#).

**NOTE:** This report is blank if none of the traffic classes in the Multi-Path template allows traffic to be switched when latency or loss thresholds are exceeded (no probes are issued to measure performance).

To view multi-path performance:

1. Click **MONITOR** in the menu frame, and **MULTI-PATH** in the navigation frame.
2. Select the IP address of a specific device from the **Destination** menu to view the performance of the primary and secondary paths for outbound traffic to the selected device.
3. Select a time period from the **Period** menu and click **Submit**. You can select the current or previous hour, day, week, or month. The default is **This hour**.

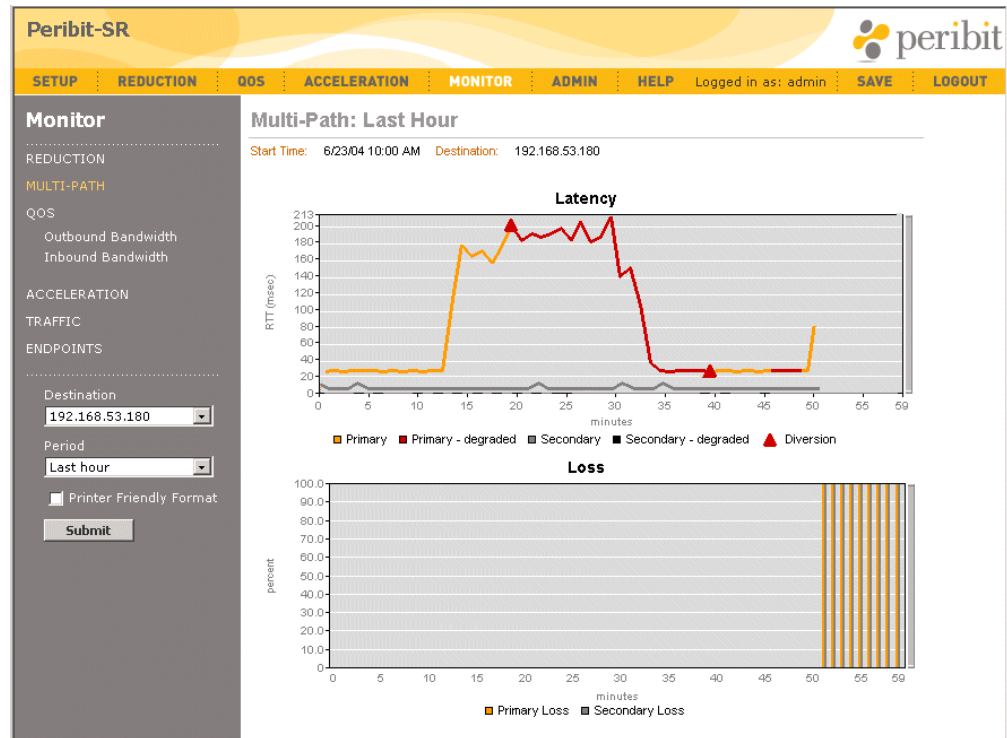




Figure 9-9 Outbound Bandwidth Statistics

#### 4. Review the following information on the Loss and Latency graphs:

The Latency chart uses colors to indicate when traffic is diverted to the alternate path. Since the color is determined by performance at the end of each time period (a minute for an hourly report, an hour for a daily report), short-term diversions are best viewed on hourly reports.

- **Primary** (orange line). Indicates that traffic is not diverted to the secondary path.
- **Primary - degraded** (red line). Indicates one of the following conditions:
  - **Loss or latency threshold exceeded.** The diversion icon  indicates that eligible traffic is switched to the alternate path. Traffic is diverted only if the secondary path's reduction tunnel is up and the loss and latency thresholds are not exceeded. When performance returns to normal, another  indicates that traffic has been switched back to the primary path (the reduction tunnel must be up). Move the cursor over the icon to view the number of events (diversions) for the selected time period.
  - **Reduction tunnel is down.** In this case, the diversion icon is NOT shown, but eligible traffic is switched to the alternate path regardless of the alternate's performance (provided the alternate reduction tunnel is up). Thus, a red line segment without an icon on each end indicates a reduction tunnel failure. Traffic that cannot be switched to the alternate path is passed through without reduction (if the link remains up and only the reduction tunnel is down).

To view the status of the primary and secondary reduction tunnels, check the Multi-Path Endpoints page (refer to [“Defining Multi-Path Endpoints” on page 119](#)) or the Endpoints Summary report (refer to [“Endpoints Summary” on page 224](#)).

---

**NOTE:** If the remote Peribit device is unreachable, both paths will be down, the Latency chart will be blank (latency cannot be measured), and the Loss chart will show 100% probe loss on both paths.

---

- **Secondary** (grey line). Indicates that traffic is not diverted to the primary path.
- **Secondary - degraded** (black line). Same behavior as the degraded primary line, except that here the primary path is the alternate path.

The Loss chart includes the following:

- **Primary Loss** (orange line). Indicates the percentage of the Peribit probes that were lost on the primary path. The probes are used to measure the path latency. If the loss threshold is exceeded, a diversion to the secondary path is indicated on the Latency chart (if the secondary path is not degraded).
- **Secondary Loss** (grey line). Indicates the percentage of the Peribit probes that were lost on the secondary path. If the loss threshold is exceeded, a diversion to the primary path is indicated on the Latency chart (if the primary is not degraded).

## Outbound Bandwidth Statistics

If outbound QoS is enabled, the Outbound Bandwidth report shows the throughput of outbound traffic to the Remote interface and the amount of traffic dropped when one or more of the traffic classes exceeds its maximum allocated bandwidth. To configure outbound QoS settings, refer to [“Configuring Outbound QoS Policies” on page 153](#).

---

**NOTE:** Outbound bandwidth management is not effective for an off-path Peribit device unless all outbound WAN traffic is routed through the device.

---

To view outbound bandwidth statistics:

1. Click **MONITOR** in the menu frame, and **Outbound Bandwidth** in the navigation frame.
2. Change one or more of the following report parameters, and click **Submit**.
  - Select the IP address of a specific device from the **Destination** menu to view statistics only for traffic sent to the selected device. The default is **Other traffic** (all traffic that is not sent to a remote Peribit device).
  - Select an application traffic class from the **Class** menu. The default is **All Classes**.
  - Select a time period from the **Period** menu. You can select the current or previous hour, day, week, or month. The default is **This hour**.

If the selected time period is for a day or longer, you can select **Non-Prime Time Only** to view statistics based on the QoS policies defined for non-critical hours. By default, prime-time and non-prime time QoS policies are the same.

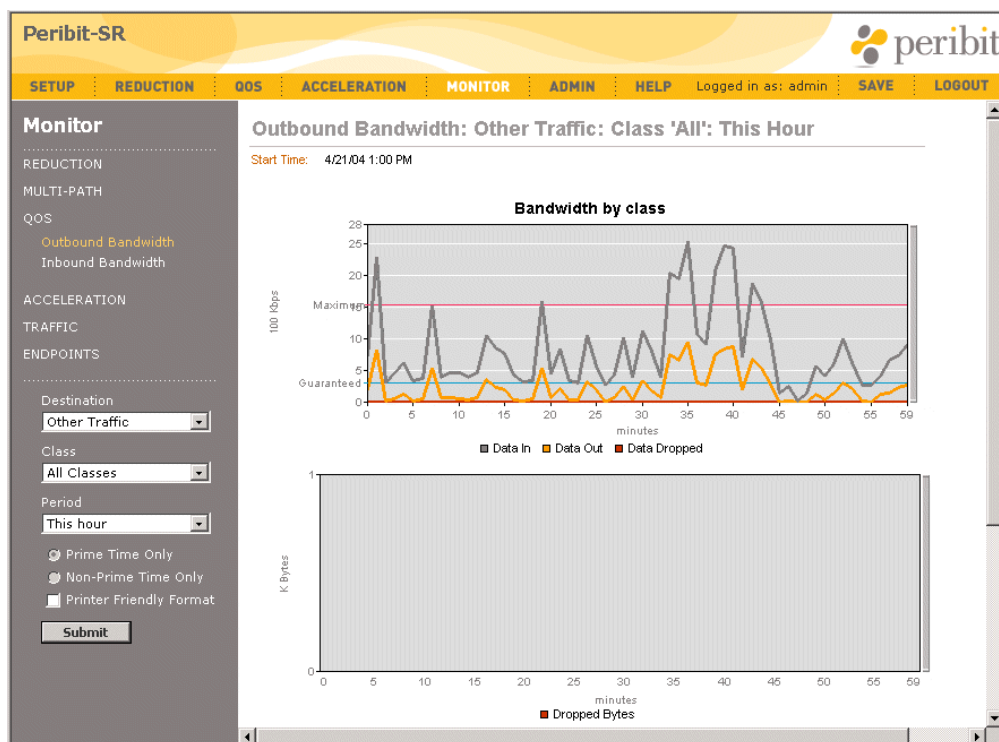


Figure 9-10 Outbound Bandwidth Statistics

3. Review the following information on the three line graphs. Keep in mind that all values are for the selected destination, traffic class, and time period.
  - The Bandwidth by class graph shows the following:
    - **Data In** (grey line). Average data throughput into the Local interface from the LAN side of the Peribit device.
    - **Data Out** (orange line). Average throughput to the WAN side of the device. Indicates the data reduction achieved for the selected destination. The **Guaranteed** line shows the minimum bandwidth that is always available to the selected traffic class. If **All Classes** is selected, the guaranteed bandwidth is zero.

---

**NOTE:** The **Data Out** will be less than the remote circuit speed due to the overhead data produced by the Peribit device, but excluded from statistical reports.

---

- **Data Dropped** (red line). Average rate that outbound data was dropped. Data is dropped when the traffic for the selected class exceeds the maximum allocated bandwidth (the **Maximum** line on the graph). If **All Classes** is selected, the maximum bandwidth is the circuit speed.
- Note that brief bursts of traffic can cause data to be dropped, even when the average throughput is well below the maximum bandwidth.
- The Dropped Bytes and Dropped Packets graphs show the number of bytes and packets that were dropped when the maximum bandwidth for a traffic class (or the entire circuit) was exceeded.

## Inbound Bandwidth Statistics

If inbound QoS is enabled, the Inbound Bandwidth report shows the throughput of inbound traffic from the WAN and the amount of traffic dropped when one of the predefined traffic classes (Reduced, Intranet, TCP, and Default) exceeds its maximum allocated bandwidth. To configure inbound QoS settings, refer to [“Configuring Inbound QoS Policies” on page 173](#).

---

**NOTE:** Inbound bandwidth management is not supported for off-path Peribit devices.

---

To view inbound bandwidth statistics:

1. Click **MONITOR** in the menu frame, click **Inbound Bandwidth** in the left-hand navigation frame.
2. Select a traffic class from the **Class** drop-down menu. The default is **All Classes**.
3. Select the time period for the report, and click **Submit**.

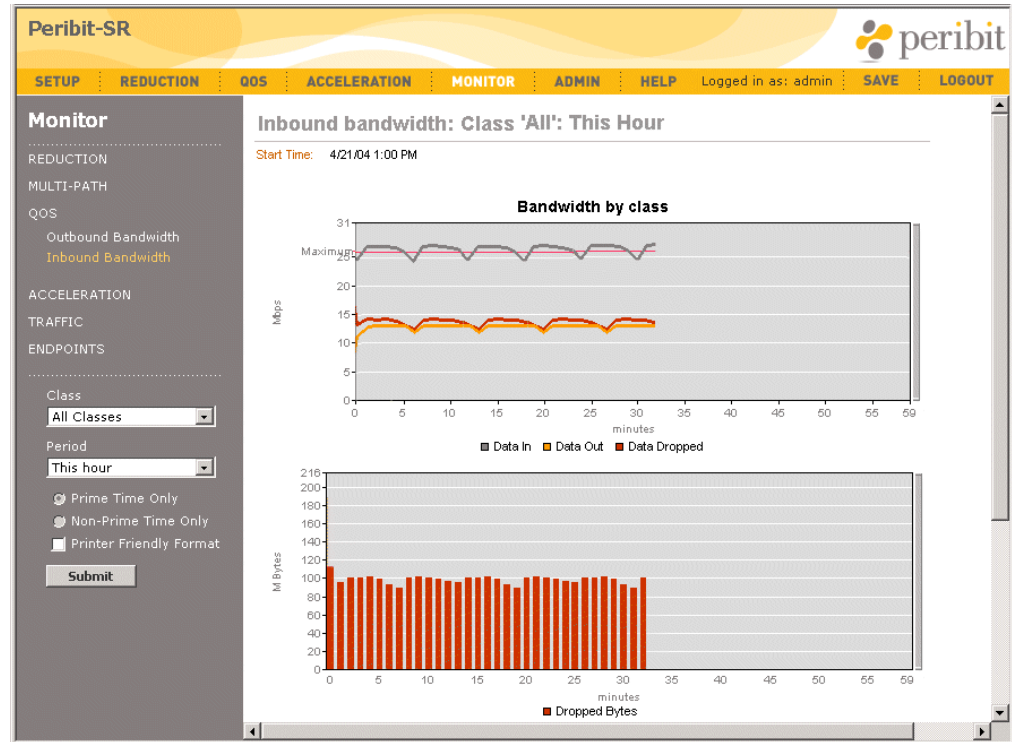


Figure 9-11 Inbound Bandwidth Utilization Statistics

4. Review the following information on the three line graphs. Keep in mind that all values are for the selected traffic class and time period.
  - The Bandwidth by class graph shows the following:
    - **Data In** (grey line). Average data throughput from the WAN side of the device.
    - **Data Out** (orange line). Average data throughput out to the LAN side of the device.
    - **Data Dropped** (red line). Average rate that inbound data is dropped when the traffic for the selected class exceeds the maximum allocated bandwidth (the **Maximum** line on the graph). When **All Classes** is selected, the **Maximum** line is the aggregate WAN speed, which may be well above the maximum for the class(es) whose traffic is being dropped.
  - The Dropped Bytes and Dropped Packets graphs show the number of bytes and packets that were dropped when a traffic class exceeded its maximum allocated bandwidth.



## Application Acceleration Statistics

This section describes the statistics displayed for two types of Packet Flow Acceleration reports:

- [“Flow Pipelining and Active Flow Pipelining Statistics” in the next section](#)
- [“Fast Connection Setup Statistics” on page 219](#)
- [“Forward Error Correction Statistics” on page 221](#)

### Flow Pipelining and Active Flow Pipelining Statistics

If Flow Pipelining and/or Active Flow Pipelining is enabled for one or more endpoints and applications, the Flow Pipelining/AFP report shows the session statistics and the average throughput improvements due to Flow Pipelining and/or AFP. To configure Flow Pipelining or AFP for specific endpoints and applications, refer to [“Configuring Packet Flow Acceleration” on page 177](#).

To view Flow Pipelining statistics:

1. Click **MONITOR** in the menu frame, and then click **ACCELERATION** in the left-hand navigation frame.
2. Select **Flow Pipelining/AFP** from the **Statistic** drop-down menu, change one or more of the following report parameters, and click **Submit**.
  - Select an application from the **Application** menu to view the acceleration statistics to each remote Peribit device. Select **Others** to view statistics for applications that are undefined or unmonitored. The default is **All**, which shows the average acceleration for all applications to all devices.
  - Select the IP address of a specific device from the **Destination** menu to view statistics only for traffic sent to the selected device. The default is **All**.
  - Select a time period from the **Period** menu. You can select the current or previous hour, day, week, or month. The default is **This hour**.

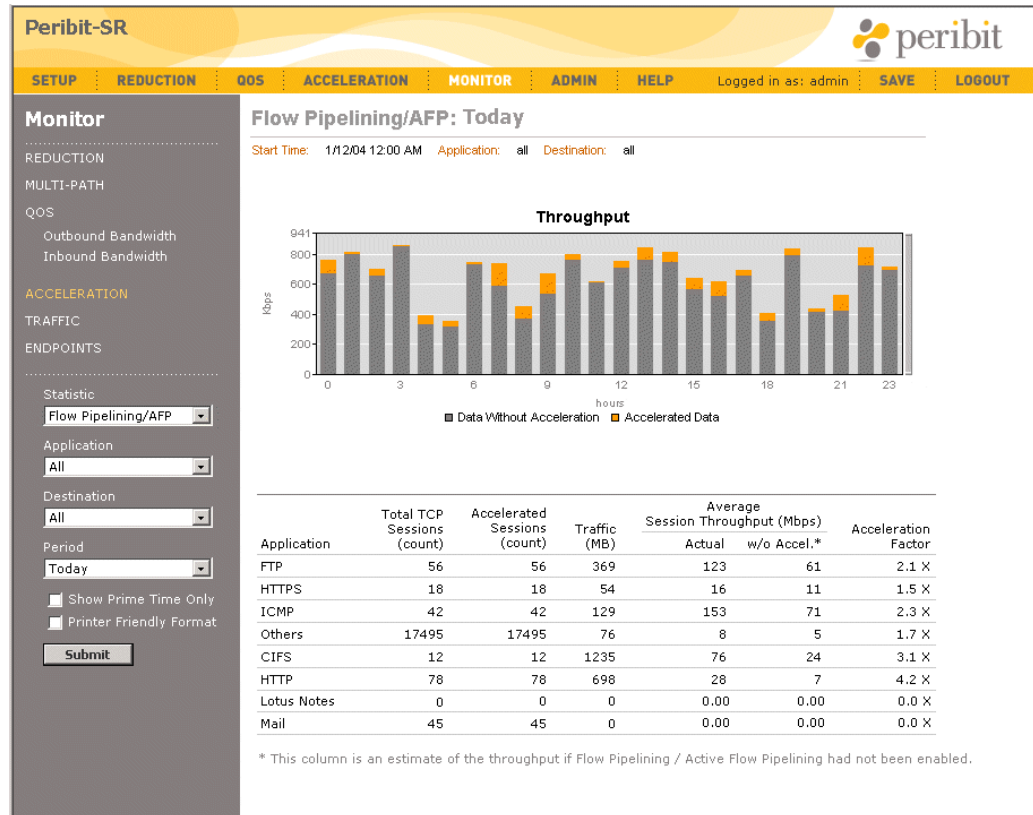


Figure 9-12 Flow Pipelining Statistics

Review the following information. Keep in mind that all values are for the selected application, destination, and time period.

- The Throughput bar graph shows the following:
  - **Data Without Acceleration** (grey bars). Average data throughput with no acceleration for applications that have Flow Pipelining or Active Flow Pipelining enabled.
  - **Accelerated Data** (orange bars). Average increase in data throughput as a result of Flow Pipelining or Active Flow Pipelining.
- The table has the following columns.
  - **Application or Destination.** Name of the accelerated application(s) or, if you select a specific application, the IP addresses of each remote device.
  - **Total TCP Sessions.** Number of sessions that ended in the selected time period.
  - **Accelerated Sessions.** Number of accelerated sessions that ended in the selected time period.
  - **Traffic (MB).** Number of megabytes of traffic into the device that is accelerated. For Flow Pipelining, sessions cannot be accelerated if the TCP window scale option is enabled or if the TCP receive window is set to 64 KB. Also, network congestion may limit the receive window to less than 64 KB.

- **Average Session Throughput (Mbps).** Average throughput of all sessions, versus the estimated average throughput if Flow Pipelining or Active Flow Pipelining was disabled.
- **Acceleration Factor.** The performance increase for the accelerated sessions due to Flow Pipelining or Active Flow Pipelining (actual throughput divided by the estimated throughput without acceleration). This value indicates the overall impact of Flow Pipelining or Active Flow Pipelining.

## Fast Connection Setup Statistics

If Fast Connection Setup is enabled for one or more endpoints and applications, the Fast Connection Setup report shows the session statistics and the average percentage reduction in session time due to Fast Connection Setup. To configure Fast Connection Setup for specific endpoints and applications, refer to [“Configuring Packet Flow Acceleration” on page 177](#).

To view Fast Connection Setup statistics:

1. Click **MONITOR** in the menu frame, and then click **ACCELERATION** in the left-hand navigation frame.
2. Select **Fast Connection** from the **Statistic** drop-down menu, change one or more of the following report parameters, and click **Submit**.
  - Select an application from the **Application** menu to view the acceleration statistics to each remote device. The default is **All**, which shows the average acceleration for all applications to all devices.
  - Select the IP address of a specific device from the **Destination** menu to view statistics only for traffic sent to the selected device. The default is **All**.
  - Select a time period from the **Period** menu. You can select the current or previous hour, day, week, or month. The default is **This hour**.

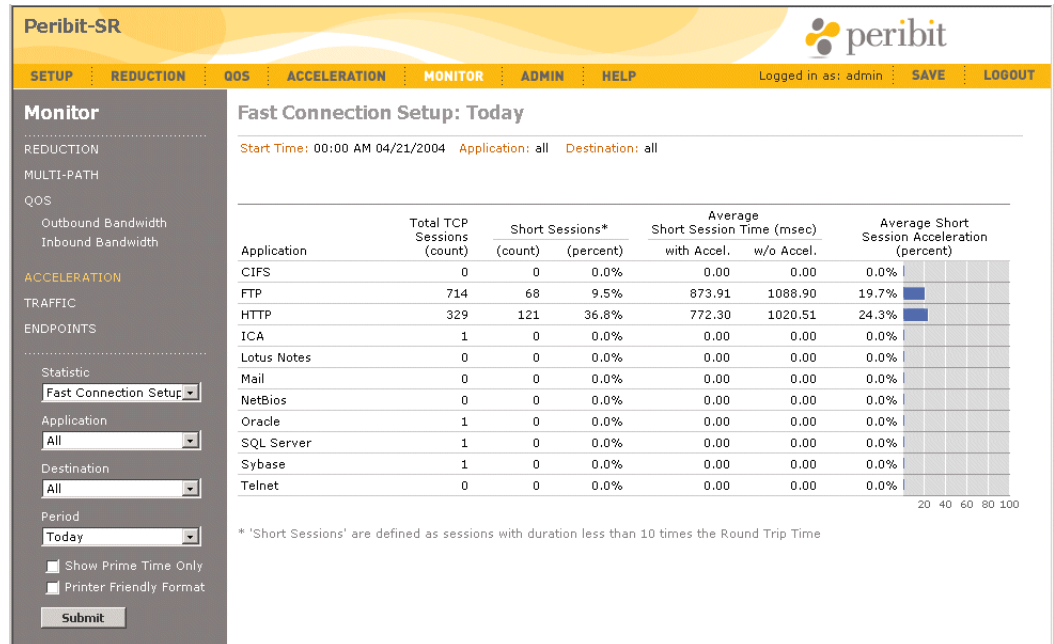


Figure 9-13 Fast Connection Setup Statistics

3. Review the following information. Keep in mind that all values are for the selected application, destination, and time period.

- **Application or Destination.** Name of the accelerated application(s) or, if you select a specific application, the IP addresses of each remote Peribit device.
- **Total TCP Sessions.** Number of sessions that ended in the selected time period.
- **Short Sessions.** Number of “short” TCP sessions accelerated, and the percentage of the total sessions. These columns show the relative number of sessions that benefit from Fast Connection Setup. Short sessions are those that last less than ten times the round-trip time (RTT). If a specific application traffic flow has five consecutive short sessions, subsequent identical traffic flows will be accelerated.
- **Average Short Session Time (msec).** Average duration of the accelerated sessions (in milliseconds), versus what the average session time would have been if Fast Connection Setup was disabled.
- **Average Short Session Acceleration (percent).** The average percentage reduction in session time, calculated as follows:

$$100 - [100 (\text{Accelerated session time})/(\text{Session time without acceleration})]$$

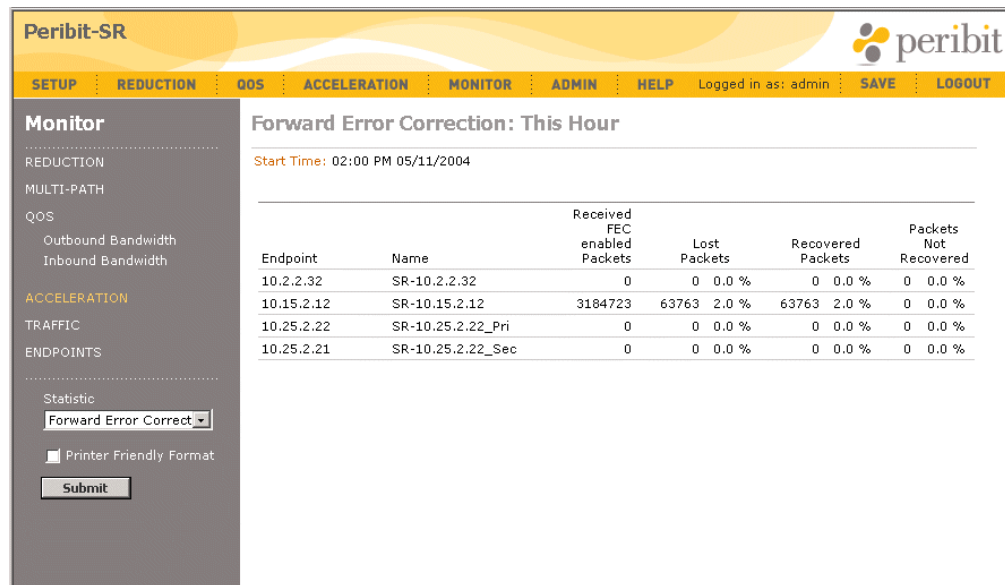
This value indicates the overall impact of Fast Connection Setup on the accelerated sessions.

## Forward Error Correction Statistics

The Forward Error Correction report shows the number of packets received from each remote endpoint that has forward error correction enabled. The report also shows the percentage of received packets that were lost, recovered, and retransmitted. To configure forward error correction for outgoing traffic to specific endpoints, refer to [“Configuring Packet Flow Acceleration” on page 177](#). Note that forward error correction is accepted on incoming traffic regardless of whether it is used for outgoing traffic.

To view forward error correction statistics:

1. Click **MONITOR** in the menu frame, and then click **ACCELERATION** in the left-hand navigation frame.
2. Select **Forward Error Correction** from the **Statistic** drop-down menu, and click **Submit**.



**Figure 9-14 Forward Error Correction Statistics**

3. Review the following information. Keep in mind that all values are for the selected time period.
  - **Received Packets.** Number of error correction packets (data and recovery packets) received from the specified endpoint.
  - **Lost Packets.** Number and percentage of the received packets that were lost.
  - **Recovered Packets.** Number and percentage of the lost packets that were recovered using the recovery packets.
  - **Packets Not Recovered.** Number and percentage of the lost packets that had to be retransmitted.

## Viewing and Exporting Top Traffic Statistics

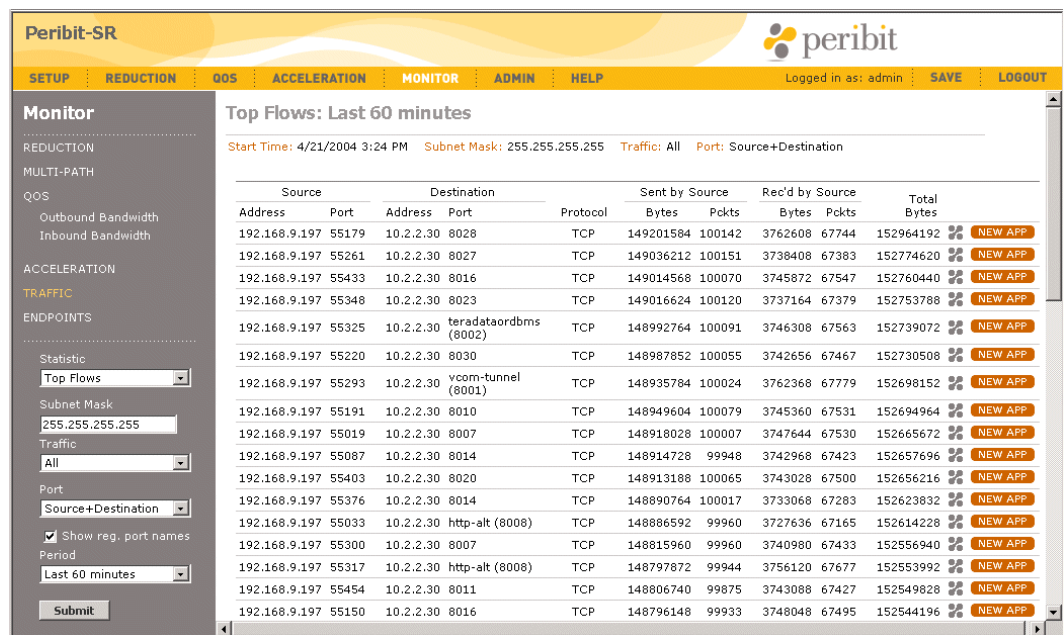
The Top Traffic data collection tool lets you collect traffic statistics for the most active traffic flows, including the protocol, source and destination addresses and ports, and the number of packets and bytes sent and received. The collected statistics can be sent to a Cisco NetFlow server or displayed in the Web console (but not both). Undefined application flows displayed in the Web console are flagged so that you can quickly populate application definitions with the correct addresses and ports.

**NOTE:** A flow constitutes data sent and/or received from a single source IP address and port number, to a single destination IP address and port number using the same protocol.


You can view the top traffic statistics for the past hour, the past 24 hours, or all available hours (the length of time depends on the traffic volume). The 65,000 most active flows are recorded. You can view the top 50 flows in the Web console, but the complete list can be exported to a file in CSV format.

To view the Top Traffic page:

1. Click **MONITOR** in the menu frame, and click **TRAFFIC** in the left-hand navigation frame.
2. To view the top traffic flows for the past hour, click **Submit**. If NetFlow records are being generated, you cannot view traffic statistics in the Web console (refer to “[Generating NetFlow Records](#)” on page 238).



**Figure 9-15** Top Traffic Statistics

3. To create a new application definition with the addresses, ports, and protocol shown for a specific traffic flow, click **NEW APP** next to the traffic flow. For more information about defining applications, refer to “[Managing Applications](#)” on page 90. Note that an  is shown next to the flows for undefined applications.

4. To filter the traffic statistics, specify the following information and click **Submit**.

Statistic	<p>Select a view of the traffic statistics. Each is displayed in descending order by traffic volume.</p> <ul style="list-style-type: none"> <li>• <b>Top Flows.</b> Traffic sent and received between the top 50 pairs of source and destination addresses and ports. Note that the “Source” address also receives data, and the “Destination” address also sends data. The number of bytes and packets sent and received are the combined totals for the source and destination.</li> <li>• <b>Top Sending Addresses.</b> Traffic sent by the top 50 addresses.</li> <li>• <b>Top Sending Ports.</b> Traffic sent by the top 50 ports.</li> <li>• <b>Top Receiving Addresses.</b> Traffic received by the top 50 addresses.</li> <li>• <b>Top Receiving Ports.</b> Traffic received by the top 50 ports.</li> </ul>
Subnet mask	<p>If you select the top flows, sending addresses, or receiving addresses, enter a subnet mask to view all traffic from the same subnet as one consolidated entry. The default mask “255.255.255.255” shows a separate flow for each host.</p>
Traffic	<p>Select a view of the traffic for the selected statistic.</p> <ul style="list-style-type: none"> <li>• <b>All.</b> All traffic for the selected statistic.</li> <li>• <b>All Reduced.</b> Reduced traffic only.</li> <li>• <b>Reduced Undefined Apps.</b> Reduced traffic for undefined applications only.</li> <li>• <b>Passthrough Only.</b> Traffic that was not reduced.</li> </ul>
Port	<p>If you select the <b>Top Flows</b> statistic, you can select a view of the port information.</p> <ul style="list-style-type: none"> <li>• <b>Ignore Port.</b> Traffic is consolidated across all ports for each pair of source and destination addresses.</li> <li>• <b>Source Only.</b> Traffic is consolidated across the same source ports for each pair of source and destination addresses.</li> <li>• <b>Destination Only.</b> Traffic is consolidated across the same destination ports for each pair of source and destination addresses.</li> <li>• <b>Source + Destination.</b> Traffic is shown for each combination of source and destination port.</li> </ul>
Show reg. port names	<p>If you select the <b>Top Flows</b> statistic, click the check box to view the registered names for all ports in the collected data. Clear the check box to view the names only for port numbers up to 1024.</p>
Period	<p>Select the time period (last 60 minutes, last 24 hours, or all).</p>

5. To export the traffic statistics to a file in CSV format, click **TRAFFIC** in the left-hand navigation frame, and click **Export**. Enter the number of top traffic flows you want to save, and click **Export**.

6. To erase the current traffic statistics, click **TRAFFIC** in the left-hand navigation frame, and click **Clear**.

## Endpoints Summary

The Endpoints Summary report shows the status of reduction tunnels, Network Sequence Monitoring, IPSec encryption, Multi-Path, and Packet Flow Acceleration between the current Peribit device and each of the other devices in the community. The Endpoints Summary also indicates whether outbound QoS is enabled to the remote device, and, if so, the speed of the remote WAN circuit.

To view the Endpoints Summary:

1. Click **MONITOR** in the menu frame, and click **ENDPOINTS** in the left-hand navigation frame.

Endpoint	Name	Reduction (Outbound)	Reduction (Inbound)	Network Sequence Mirroring	Encryption	Circuit Speed (Kbps)	QoS (Outbound)	Flow Pipelining	Fast Connection Setup	Active Flow Pipelining	Forward Error Correction	Multi-Path
10.15.2.12	3 SR-10.15.2.12	OK	OK	OK	OK	1500	✓	○	✓	○	○	○
10.25.2.22	3 SR-10.25.2.22_Pri	○	○	○	○	256	✓	✓	✓	○	○	✗
10.25.2.21	3 SR-10.25.2.22_Sec	OK	OK	OK	OK	256	✓	○	○	○	○	OK
10.2.2.32	3 SR-10.2.2.32	OK	○	OK	OK	128	✓	○	○	○	○	○

Figure 9-16 Endpoints Summary




2. The following icons are used to indicate the status of each connection:

Table 9-1 Endpoints Icon Descriptions

Icon	Description
✓	<b>Enabled</b> — Indicates which of the following features are enabled between this Peribit device and each remote device: <ul style="list-style-type: none"> <li>• Outbound QoS</li> <li>• Encryption (IPSec license required)</li> <li>• Packet Flow Acceleration method</li> </ul>
●	<b>Normal operation</b> — A connection is established between this device and the remote device.
⚠	<b>Warning</b> — Indicates that new IPSec security associations (SAs) are being negotiated due to an encryption configuration change. If this icon is displayed for more than a minute or two, the negotiation has failed and the old security association will eventually expire.



Table 9-1 Endpoints Icon Descriptions

Icon	Description
	<p><b>Down</b> — No connection for the following features:</p> <ul style="list-style-type: none"> <li>• <b>Encryption.</b> A security association has not been negotiated, and the default IPSec policy is applied to all traffic sent to this endpoint (refer to <a href="#">“Defining the Default IPSec Policy” on page 199</a>).</li> <li>• <b>Multi-Path.</b> The outbound reduction tunnel is down (check the <b>Reduction (Out-bound)</b> column) or the path’s loss or latency thresholds are exceeded.</li> <li>• <b>Network Sequence Mirroring.</b> A problem exists or NSM is disabled on the remote device.</li> </ul>
	<b>Not configured</b> — The feature is not configured on this device and/or the remote device.
	<b>Unknown</b> — The connection is in a transitory state.
Blank	A blank in the Network Sequence Mirroring column indicates that the remote device is not a Sequence Mirror or the reduction tunnel to the device is down.



## Chapter 10 Maintaining Peribit Devices

---

This chapter describes how to maintain the Peribit device through the Web console.

- [“Maintaining Configurations and Software” in the next section.](#)
- [“Using Maintenance Tools” on page 234.](#)

---

**NOTE:** If you have the Peribit Central Management System (CMS), you can schedule software and configuration updates for all Peribit devices in a community.

---

### Maintaining Configurations and Software

The following topics describe how to maintain the device’s configuration and software through the Web console:

- [“Saving the Device Configuration” in the next section.](#)
- [“Displaying the Running Configuration” on page 229.](#)
- [“Loading a Device Configuration File” on page 230.](#)
- [“Loading a Boot Image” on page 231.](#)
- [“Clearing Application Monitoring Statistics” on page 232.](#)
- [“Setting the Device to the Factory Default Configuration” on page 232.](#)
- [“Rebooting the Device” on page 234.](#)

#### Saving the Device Configuration

When you change a device’s configuration, you must save the configuration file to Flash memory to preserve the settings the next time the device is restarted. You can also save the configuration file to another location for backup, such as an FTP or TFTP server. If a problem occurs where you must restore the factory default settings, you can load a saved configuration file to restore your network settings.

---

**NOTE:** A configuration file contains device-specific information, such as IP network addresses. Therefore, do not load the configuration file from one Peribit device to another.

---

To save the device configuration:

1. Click **ADMIN** in the menu frame, and then click **Save Configuration** in the left-hand navigation frame.

**Figure 10-1 Saving the Configuration**

2. Select one of the following:

Flash memory	<p>Save the current configuration to <i>startup.cfg</i> in Flash memory or click <b>Save to the filename</b> and enter another name. The name can be up to eight characters, with no file extension (such as “myconfig”). Click <b>Save</b>.</p> <p>Note that <i>startup.cfg</i> is loaded each time you reboot the device. Always save the standard configuration to <i>startup.cfg</i>. Saving to a backup location is also recommended.</p>
Local disk drive	<p>Save the current configuration to the disk of a local machine in your network. Select this option, click <b>Save</b>, and specify the file name and location.</p>
TFTP server	<p>Save the current configuration to a TFTP server in your network. Enter the server’s IP address and a path and file name on the server, such as “/peribit/config_save.cfg”. Click <b>Save</b>.</p>
FTP server	<p>Save the current configuration to an FTP server in your network. Enter the server’s IP address and a path and file name on the server, such as “/peribit/config_save.cfg”. If the FTP server does not accept anonymous user access, enter a user name and password with read/write privileges to the server. Click <b>Save</b>.</p>

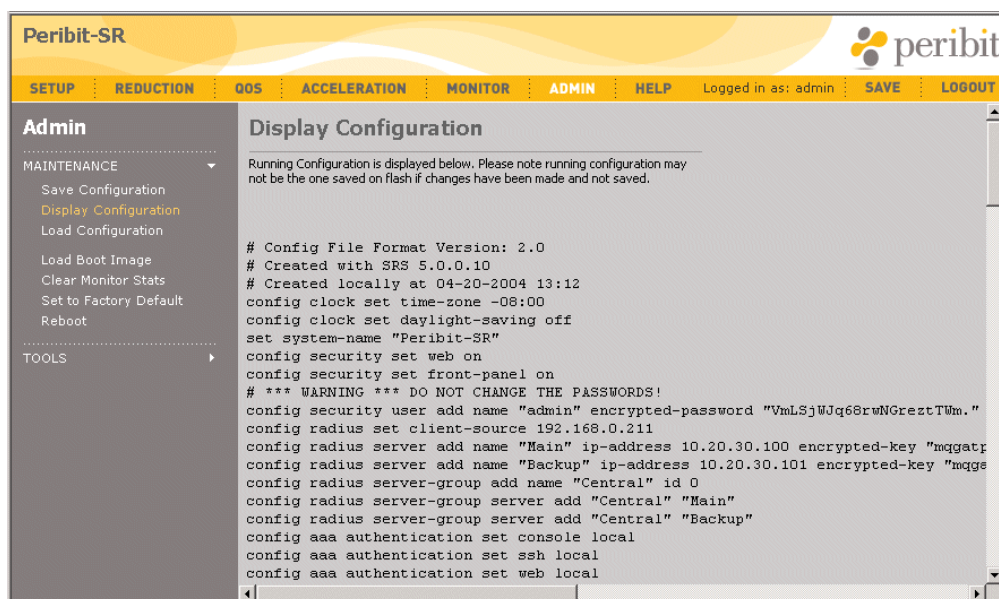
3. After saving the configuration, you can reboot the device and reload the configuration settings if necessary.

## Displaying the Running Configuration

The current configuration running on the device can be viewed through the Web console. The running configuration may be different from the configuration saved in Flash memory.

To view the running configuration:

1. Click **ADMIN** in the menu frame, and then click **Display Configuration** in the left-hand navigation frame.



**Figure 10-2 Displaying the Parameters of the Running Configuration**

- Some configuration parameters can be set only through the CLI (refer to [“Using the Command Line Interface \(CLI\)” on page 245](#)).

## Loading a Device Configuration File

You can change a device's configuration by loading a configuration file that was previously saved to Flash memory, a local disk, or an FTP or TFTP server.

---

**NOTE:** A configuration file contains device-specific information, such as IP network addresses. Therefore, do not load the configuration file from one Peribit device to another.

---

To load a configuration file:

1. Click **ADMIN** in the menu frame, and then click **Load Configuration** in the left-hand navigation frame.

**Figure 10-3 Loading a Configuration File**

---

**NOTE:** Verify that the configuration file contains the correct configuration for the device. Loading an improper configuration file can have adverse effects on the device and on the other Peribit devices in the community.

---

2. Select the source for the configuration file (including location and file name), and then click **Load**.
3. To retain the configuration when the device is restarted, click **SAVE** in the menu frame to save the configuration to *startup.cfg* in Flash memory. This step is unnecessary if you load *startup.cfg* from Flash memory.
4. If the new configuration file changes the device's IP address, you **MUST** save the configuration to *startup.cfg* in Flash memory, and then reboot the device, as described in [“Rebooting the Device” on page 234](#).

## Loading a Boot Image

To upgrade the SRS operating system on a Peribit device, you can load a new boot image from a local disk or an FTP or TFTP server. You can then reboot the device to activate the new software. Loading a boot image does not affect the configuration settings stored in the *startup.cfg* file. All configuration information is preserved.

To load a boot image:

1. Click **ADMIN** in the menu frame, and then click **Load Boot Image** in the left-hand navigation frame.

The screenshot shows the 'Peribit-SR' web interface. The top navigation bar includes tabs for SETUP, REDUCTION, OOS, ACCELERATION, MONITOR, ADMIN, and HELP. The left sidebar is titled 'Admin' and contains a 'MAINTENANCE' section with options like Save Configuration, Display Configuration, Load Configuration, Load Boot Image (highlighted), Clear Monitor Stats, Set to Factory Default, and Reboot. The main content area is titled 'Load Boot Image' and contains three radio button options: Local Disk, TFTP server, and FTP server. Each option has associated input fields for file path/name, IP address, and user credentials. There is a 'Load' button and a checkbox for 'Allow image downgrade'.

**Figure 10-4 Loading a Boot Image**

2. Select the appropriate source for the software image (including location and file name), and click **Load**.

**NOTE:** To downgrade to a previous version of SRS, select **Allow image downgrade**. Always save the current configuration file before upgrading to a new release so that you can reload the configuration if you must downgrade to the previous release.

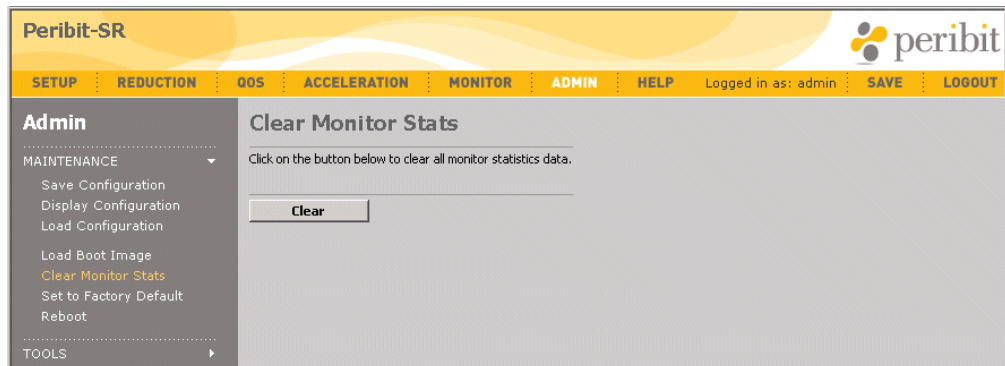
3. Reboot the device to activate the new system software. Refer to [“Rebooting the Device” on page 234](#) for more information.

## Clearing Application Monitoring Statistics

At any time you can reset all the application monitoring statistics to zero. This may be useful during testing.

To clear the application monitoring statistics:

1. Click **ADMIN** in the menu frame, and then click **Clear Monitor Stats** in the left-hand navigation frame.



**Figure 10-5** Clearing Application Monitoring Statistics

2. To clear the application monitoring statistics, click **Clear**.

## Setting the Device to the Factory Default Configuration

You can erase all device configuration information, including reduction statistics and network address information, by restoring the factory default configuration. This is useful when you must move the device to another location.

---

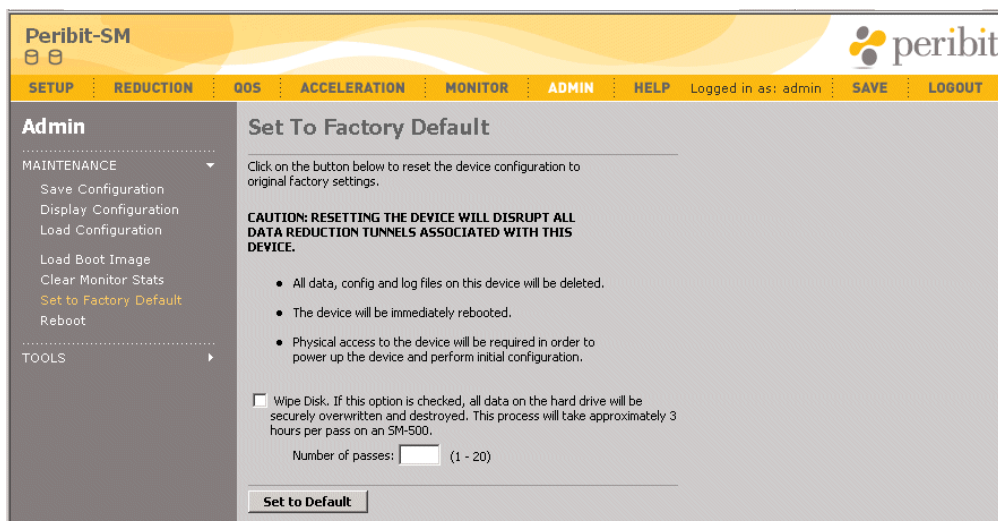
**NOTE:** Restoring the factory default configuration removes all data, configuration information and log files. It also disrupts the reduction tunnels associated with this device. Before you restore the factory default configuration, it is strongly recommended that you back up the configuration file to another location (refer to [“Saving the Device Configuration” on page 227](#)). In addition, you must have physical access to restart the device and do the initial configuration.

---

To set the device to the factory default configuration:

1. Click **ADMIN** in the menu frame, and then click **Set to Factory Default** in the left-hand navigation frame.





**Figure 10-6 Restoring the Factory Default Configuration Settings**

2. Before you set the device to its factory default configuration, verify that other devices in the Peribit Community are not affected while this device is offline.
3. On a Sequence Mirror (SM) device, you may want to wipe the hard disks for security purposes. Click the **Wipe Disk** check box, and enter the number of passes used to wipe the disks (up to 20). During each pass, a different value is written to each byte on the disks.

The first pass uses random numbers, the second pass writes a repeated pattern, the third pass uses zeros, the fourth pass writes another repeated pattern, while the fifth pass repeats the sequence with random numbers, shifted by one byte. Each pass takes about three hours. For maximum security, five passes are recommended. To stop the process, reboot the device.

4. Click **Set to Default**. If you elected to wipe the disks, the current pass number and the percent completion of the pass are displayed. After the disks are wiped, the factory defaults are loaded.
5. Wait until the LCD on the front panel displays the following:  

“Factory Default. Power System Off”
6. Unplug the power cable from the back of the device, plug the cable back in, and then specify the IP address, subnet mask, and default gateway for the device (refer to [“Installation” on page 27](#)).

## Rebooting the Device

If you load a new boot image of the SRS software on a device, you must reboot the device to activate the new software. During a reboot, the current boot image (*srs.os*) and the device configuration file (*startup.cfg*) are loaded from Flash memory into main memory. For an SR-15, you can use the CLI to select a specific boot image to be loaded (refer to [“Reboot Command” on page 254](#)).

In addition, you can reboot a Peribit device in Safe Mode so that the power stays on, but all traffic is passed through without reduction.

To reboot the device:

1. Click **ADMIN** in the menu frame, and then click **Reboot** in the navigation frame.

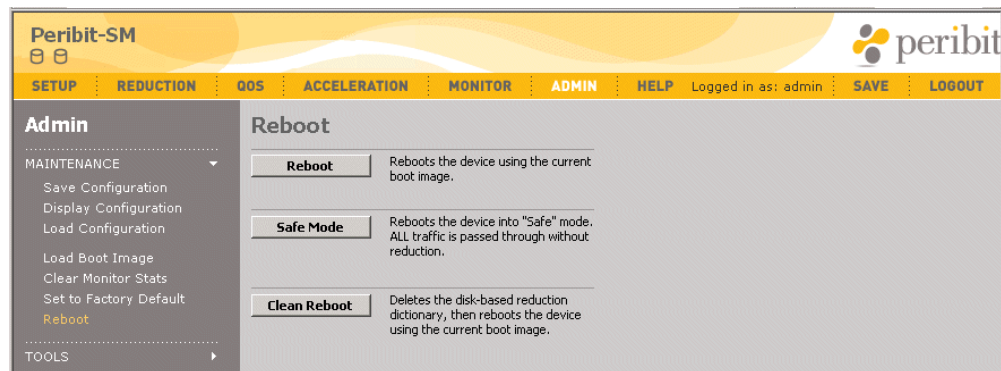


Figure 10-7 Rebooting the Device

2. Select one of the following:

Reboot	Performs a standard reboot of the device.
Safe Mode	Reboots the device so that the power is on, and the device can be configured, but all traffic is passed through without reduction. Note the following: <ul style="list-style-type: none"> <li>• The Ethernet ports are not enabled after the reboot, and the warning “ERROR SW Passthru” is displayed in the front panel</li> <li>• To exit Safe Mode, click <b>Reboot</b> to do a standard reboot.</li> </ul>
Clean Reboot	Reboots the device and clears the reduction dictionary used for Network Sequence Monitoring. Available only on Sequence Mirror devices.

## Using Maintenance Tools

The following topics describe how to use the maintenance tools through the Web console:

- [“Pinging a Network Device” in the next section](#)
- [“Running a Traceroute to a Network Device” on page 236](#)
- [“Running a Packet Capture” on page 237](#)
- [“Generating NetFlow Records” on page 238](#)
- [“Entering CLI Commands from the Web Console” on page 239](#)

- “Viewing and Saving System Logs” on page 240
- “Viewing and Saving the Access Control Log” on page 241
- “Exporting Performance Data” on page 242
- “Creating a Diagnostic File” on page 243
- “Viewing the SR-100 Server/Client Summary” on page 244

## Pinging a Network Device

You can use the ping utility to verify connections to other Peribit devices, or other network devices.

To use the ping utility:

1. Click **ADMIN** in the menu frame, click **TOOLS** in the left-hand navigation frame, and then click **Ping**.

**Figure 10-8** Using the Ping Utility

2. In the destination field, enter the IP address of a Peribit device or other network device.
3. Optionally, enter the size of each ping packet (8 to 4068 bytes), and the number of packets sent (1 to 50).
4. Click **Submit** to ping the device. The results are shown in the Web console, including the round-trip time of each packet (in milliseconds). For example:

```
PING 192.168.0.127: 32 data bytes
40 bytes from 192.168.0.127: icmp_seq=0. time=2. ms
40 bytes from 192.168.0.127: icmp_seq=1. time=2. ms
40 bytes from 192.168.0.127: icmp_seq=2. time=2. ms
---192.168.0.127 PING Statistics---
3 packets transmitted, 3 packets received, 0% packet loss
round-trip (ms) min/avg/max = 2/2/2
```

---

**NOTE:** If you ping an address that is advertised by an off-path Peribit device that uses RIP for packet interception, the ping packets are routed through the Peribit device, which may affect the round trip times.

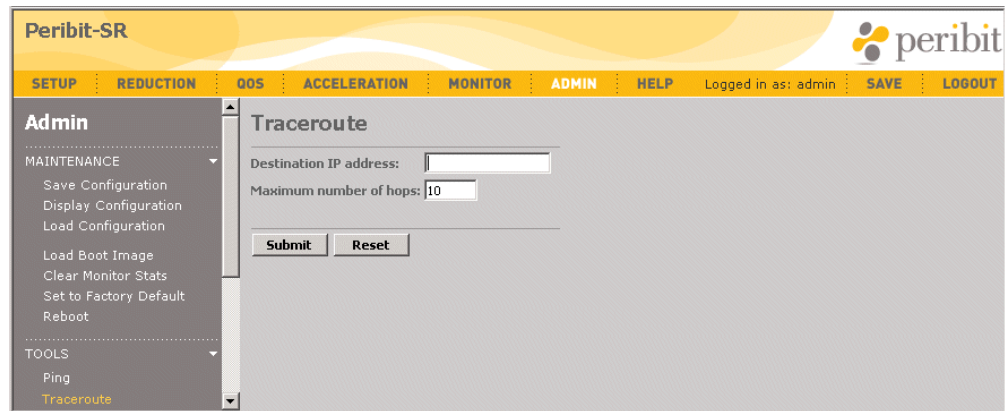
---

## Running a Traceroute to a Network Device

You can use the traceroute utility to determine the number of router hops and the route taken from the Peribit device to another network device. This tool can help you determine the point in your network that may be causing a connection failure.

To use the traceroute utility:

1. Click **ADMIN** in the menu frame, click **TOOLS** in the left-hand navigation frame, and then click **Traceroute**.



**Figure 10-9 Using Traceroute to Determine the Network Path to a Device**

2. Enter the IP address of the destination device, and the maximum number of router hops (1 to 30) to search for that device.
3. Click **Submit**. The results are displayed in the Web console, including the IP address of each device in the path, and the round-trip time (in milliseconds) of each of the three packets sent to identify each hop. For example:

```
traceroute to 192.168.0.127 (192.168.0.127), 10 hops max, 40 byte packets
 1  192.168.53.130  2 ms  0 ms  0 ms
 2  192.168.53.70   2 ms  2 ms  4 ms
 3  192.168.53.1    0 ms  2 ms  2 ms
 4  192.168.52.15   2 ms  2 ms  2 ms
 5  192.168.0.127   2 ms  2 ms  2 ms
```

---

**NOTE:** If you trace an address that is advertised by an off-path Peribit device that uses RIP for packet interception, the trace packets are routed through the Peribit device, which may affect the number of hops and round trip times.

---

## Running a Packet Capture

The packet capture utility lets you capture raw network data from the device's Local and/or Remote interfaces. The packet capture information can then be exported to a file and analyzed by a protocol analyzer program or other hardware. The packet capture's file format is either "libpcap" or "snoop".

---

**NOTE:** You must enter the packet-capture password to run or save a packet capture.

---

To use the packet capture utility:

1. Click **ADMIN** in the menu frame, click **TOOLS** in the left-hand navigation frame, and then click **Packet Capture**.

The screenshot shows the Peribit-SR web interface. The top navigation bar includes links for SETUP, REDUCTION, QOS, ACCELERATION, MONITOR, ADMIN, and HELP. The left sidebar is expanded to show the 'Admin' section, with 'TOOLS' selected. Under 'TOOLS', 'Packet Capture' is highlighted. The main content area is titled 'Packet Capture' and contains the following fields and controls:

- Interface:** A dropdown menu set to 'Local'.
- Size:** A text input field followed by 'Bytes'.
- Max. Number Packets:** Two radio buttons: 'All' (selected) and a text input field followed by 'packets'.
- Snap Length:** Two radio buttons: 'All' and '1514' (selected) followed by 'Bytes'.
- Storage Format:** A dropdown menu set to 'libpcap'.
- Delete After:** A text input field set to '1' followed by 'hours'.
- Status:** A label 'Ready'.
- Buttons:** 'Start', 'Stop', 'Save...', and 'Delete'.
- Password Field:** A text input field labeled 'Packet Capture Password:'.

Below the fields, there is a note: 'To start a packet capture or to save a packet capture to a local disk, you must enter the packet capture password.'

**Figure 10-10** Using the Packet Capture Utility

2. Specify the following information:

Interface	Select the interface(s) where you want to capture packets ( <b>Local</b> , <b>Remote</b> , or <b>Both</b> ).
Size	Enter the number of bytes to be captured (minimum is 4096). Execution stops when the specified number of bytes are captured.
Max. Number Packets	To limit the capture to a maximum number of packets, select the second option and enter the number of packets.
Snap Length	Enter the maximum number of bytes captured for each packet (1 to 65535). The default is 1514. Select <b>All</b> to capture the entire packet.
Storage Format	Select the format of the captured data ( <b>libpcap</b> or <b>snoop</b> ). The default file name is <i>pkgdump.dmp</i> .
Delete After	Enter the number of hours that the packet capture file is retained (1 to 168).
Packet Capture Password	Enter the packet capture password. To change the password, refer to <a href="#">“Changing the Packet Capture Password”</a> on page 89.

3. To start the packet capture, click **Start**. The status is displayed in the upper-right corner of the page. Click **Stop** at any time to stop the capture.
4. To save the packet capture, click **Save**, and specify a file name and location.
5. To manually delete the packet capture file, click **Delete**. You cannot run another packet capture until the previous one is deleted.

## Generating NetFlow Records

The Top Traffic data collection tool collects traffic statistics for the most active traffic flows, including the protocol, source and destination addresses and ports, and the number of packets and bytes sent and received. The collected statistics can be sent to a Cisco NetFlow server or displayed in the Web console (but not both).

To generate NetFlow records:

1. Click **ADMIN** in the menu frame, click **TOOLS** in the left-hand navigation frame, and then click **NetFlow**.

**Figure 10-11** Generating NetFlow Records

2. Click **Enable NetFlow**, and enter the IP address and port number of a NetFlow server. To view the top 50 flows in the Web console, you must first clear the check box to disable the NetFlow option (refer to [“Viewing and Exporting Top Traffic Statistics” on page 222](#)).
3. Click **Submit** to activate the changes, or click **Reset** to discard them.
4. To retain your changes when the device is restarted, click **SAVE** in the menu frame.

NetFlow data is sent in Version 5 format, as described in [“NetFlow Version 5 Export” on page 349](#).



## Entering CLI Commands from the Web Console

Some options are available only through the command line interface (CLI). You can enter CLI commands from the Web console as described here, or from a Secure Shell (SSH) program or a terminal connected to the serial port, as described in [“Accessing the CLI” on page 245](#).

Note the following when entering commands from the Web console:

- CLI configuration commands are applied to the candidate configuration when you click **Submit**. Use the “commit” command to apply changes to the running configuration.
- Only “show,” “configure,” and “commit” commands are supported, as well as “ls” and “pwd”. The “cd” command is not supported, nor are any commands that require user interaction, such as “rollback”, “save-config”, and “import-route-table”.
- The entire command must be entered on one line. For example, you cannot enter “configure” and “application” on separate lines, as you can in a Secure Shell (SSH) or terminal emulation program.
- Multiple commands can be entered together (one per line), as in a script. Up to 10 KB of commands can be entered at once.
- To view the online help for a command, type “help” before the command. You cannot use “?” to view the help. Also, the CLI keyboard shortcuts are not supported.

For more information about the CLI commands, refer to [“Using the Command Line Interface \(CLI\)” on page 245](#).

To enter CLI commands from the Web console:

1. Click **ADMIN** in the menu frame, click **TOOLS** in the left-hand navigation frame, and then click **Command Line Interface**.

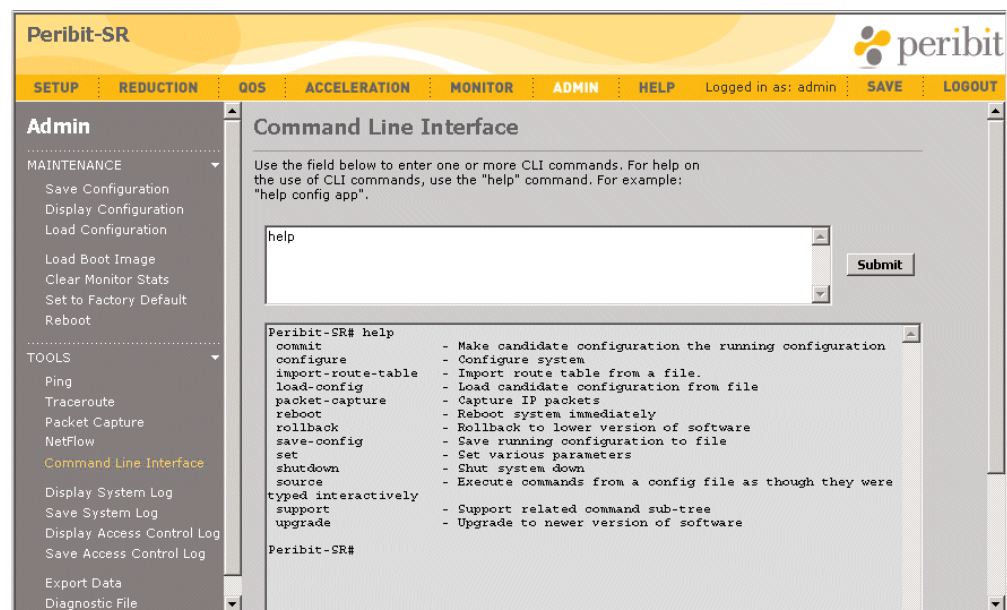


Figure 10-12 Entering CLI Commands

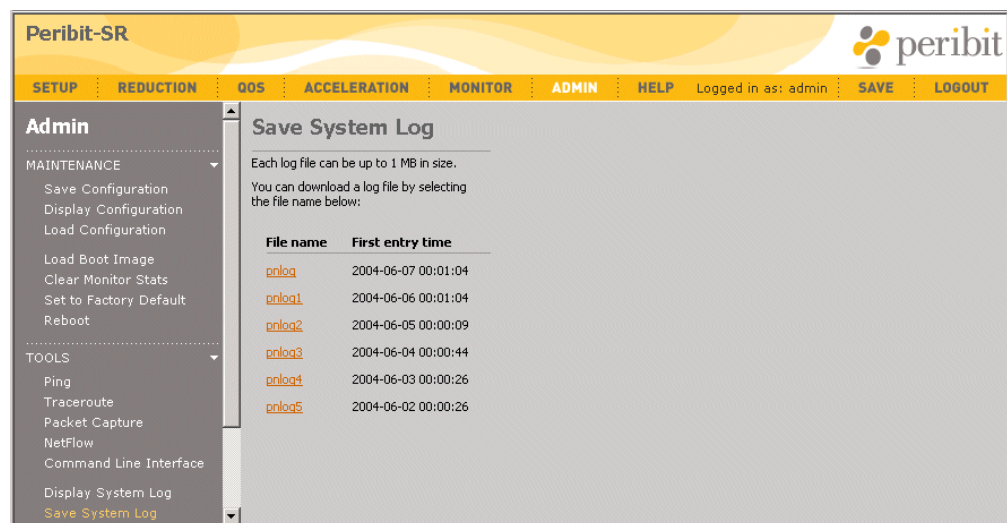
2. Enter one or more CLI commands (one per line) in the upper list box, and click **Submit**. The results are displayed in the lower list box. To clear the results, delete all the commands and click **Submit**.
3. To apply all configuration changes to the running configuration, enter the “commit” command and click **Submit**.
4. To retain your changes when the device is restarted, click **SAVE** in the menu frame.

## Viewing and Saving System Logs

The system log files can be displayed in the Web console. You can also download these log files to a local machine for use by third-party applications. If your network has dedicated Syslog servers, you can configure the Peribit device to send log messages to up to five Syslog servers, as described in [“Enabling Syslog Reporting” on page 66](#).

To view or download system log files:

1. Click **ADMIN** in the menu frame, and click **TOOLS** in the left-hand navigation frame.
2. To display the system log file, click **Display System Log** in the left-hand navigation frame. The current system log is displayed in the Web console. The most recent entries are displayed last.
3. To download a system log file for a specific time period, click **Save System Log** in the left-hand navigation frame.



**Figure 10-13 Saving the System Log file for the Running Configuration**

The **pnlog** file contains the most recent data. Each time **pnlog** reaches 1 MB in size, it is saved as **pnlog1**, and the existing log files are renumbered up to **pnlog5** (older log files are discarded). The **First entry time** column shows the oldest entry in each log file.

4. Click the name of the log file you want to save, click **Save**, and specify a file name and location.



## Viewing and Saving the Access Control Log

The access control log shows the user name, date, and time of each user who accessed the device in the past five days, as well as the configuration changes made by each user. The access method is shown as SSH (CLI access), HTTPS (Web access), or CONSOLE (direct access). The workstation IP address is included for SSH and HTTPS.

For example, the following entries indicate that a user logged in from the Web console, changed the prime time setting, and committed the change by clicking **Submit**. The “Created locally” entries indicate the time stamp of the previous and current configuration. The “CHANGED” entries indicate the previous and current values.

```
HTTPS: 192.168.0.76 admin Login 2004-05-13 08:10:19 HTTP/1.1 POST / 0
HTTPS: 192.168.0.76 admin Commit config 2004-05-13 08:11:48 0
CHANGED:
< # Created locally at 05-13-2004 07:03
----
> # Created locally at 05-13-2004 08:11
ADDED:
> config prime-time set mode on
CHANGED:
< config prime-time set hours 0-24
----
> config prime-time set hours 7-18
```

---

**NOTE:** Like the system log, the access log has six files. Viewing or saving the access log concatenates the data from all the files.

---

To view or download an access control log file:

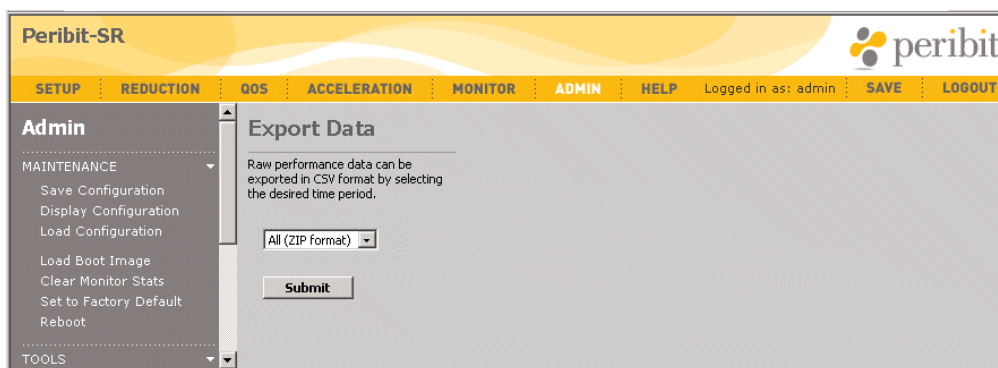
1. Click **ADMIN** in the menu frame, and click **TOOLS** in the left-hand navigation frame.
2. To display the access control log, click **Display Access Control Log** in the left-hand navigation frame. The access control log is displayed in the Web console. The most recent entries are displayed last.
3. To download the access control log, click **Save Access Control Log** in the left-hand navigation frame, click **Save**, and specify a file name and location.

## Exporting Performance Data

You can export the performance data for all time periods to a file in comma-separated variable (CSV) format. The CSV file can then be imported into a spreadsheet program (such as Microsoft Excel) or other data evaluation program. The performance data is similar to the data displayed in the Monitor page of the Web console (refer to [“Viewing Results” on page 201](#)).

To export performance data to CSV format:

1. Click **ADMIN** in the menu frame, click **TOOLS** in the left-hand navigation frame, and then click **Export Data**.



**Figure 10-14** Exporting Performance Data to CSV Format

2. In the Export Data page, select **All (ZIP format)** to export the data for all time periods as a “.zip” file. If you cannot open a “.zip” file (some browser versions cannot), select **All (CSV format)**.

Refer to [Appendix D, “Understanding Exported Data Results”](#) for a description of the CSV data file.

3. Click **Submit**, and then click **Save** and specify a file name and location.

## Creating a Diagnostic File

If you experience problems with a Peribit device, you can generate a diagnostic file to send to Peribit's support team. The diagnostic file contains current configuration, filter settings, system information, and the most recent log files. After you generate and save the diagnostic file, email it to [support@peribit.com](mailto:support@peribit.com).

To create and send a diagnostic file to Peribit support:

1. Click **ADMIN** in the menu frame, click **TOOLS** in the left-hand navigation frame, and then click **Diagnostic File**.

**Peribit-SR**

SETUP REDUCTION QOS ACCELERATION MONITOR **ADMIN** HELP Logged in as: admin SAVE LOGOUT

**Admin**

MAINTENANCE

- Save Configuration
- Display Configuration
- Load Configuration
- Load Boot Image
- Clear Monitor Stats
- Set to Factory Default
- Reboot

TOOLS

- Ping
- Traceroute
- Packet Capture
- NetFlow
- Command Line Interface
- Display System Log
- Save System Log
- Display Access Control Log
- Save Access Control Log
- Export Data
- Diagnostic File**

**Diagnostic File**

This page allows you to create a diagnostic file containing the current configuration, filter settings, and all logs for this device. This file can be emailed to Peribit Networks and can provide useful information to aid in the diagnosis of problems.

When you click the 'Submit' button, the file will be generated and downloaded to your computer. When the dialog box appears, choose 'Save this file to disk'. After the file is downloaded, attach it to an email and send it to [support@peribit.com](mailto:support@peribit.com).

For faster response, fill out the information below.

Name:

Company:

Phone:

Email:

Problem description:

**Figure 10-15** Creating a Diagnostic file for Peribit Support

2. Complete the form so that your contact information is included with the diagnostic file.
3. Click **Submit** to generate the diagnostic file, and then click **Save** and specify a file name and location. Note that a diagnostic file for an SR-100 also includes information for the client devices (if any).

Email the diagnostic file as an attachment to [support@peribit.com](mailto:support@peribit.com). A Peribit support representative will contact you.

## Viewing the SR-100 Server/Client Summary

An SR-100 can act as a server for up to six client devices. The Server/Client Summary page lets you view the port number, status, model number, and number of tunnels for each client connected to the SR-100.

To view the Server/Client Summary on an SR-100:

1. Click **ADMIN** in the menu frame, click **TOOLS** in the left-hand navigation frame, and then click **Server/Client Summary**.

Server/Client Summary				No. of Tunnels	
Port	Status	Model	OUT	IN	
1	Active	SR-50	3	1	
2	Active	SR-55	1	1	
3	Active	SR-80	0	1	
4	Not Connected				
5	Not Connected				
6	Not Connected				
stack master	Active	SR-100	1	2	

**Figure 10-16 Viewing the SR-100 Server/Client Summary**

2. Review the following information:

Port	Port number on the SR-100 where a client device is connected. The port number becomes the client ID, and is shown on the front panel of the client device.
Status	Indicates the port status: <ul style="list-style-type: none"> <li>• <b>Active.</b> Client connected and processing traffic.</li> <li>• <b>Passive.</b> Client connected, but idle.</li> <li>• <b>Not Connected.</b> No client installed.</li> </ul>
Model	Model number of the client device.
No. of Tunnels	Number of tunnels handled by each client and the SR-100. Note that remote devices see only the SR-100, not the client device that is actually processing the traffic.

## Chapter 11 Using the Command Line Interface (CLI)

---

The following topics describe how to use the command line interface (CLI) to configure Peribit devices:

- [“Accessing the CLI” in the next section](#)
- [“Logging In Using the CLI” on page 246](#)
- [“CLI Basics” on page 247](#)
- [“CLI Show Commands” on page 248](#)
- [“Top-Level CLI Commands” on page 250](#)
- [“File Management Commands” on page 258](#)
- [“CLI Configuration Commands” on page 259](#)

---

**NOTE:** You should use the Web console for most configuration tasks. However, the CLI provides some additional options that may be useful in special circumstances.

---

### Accessing the CLI

There are two ways to access the CLI:

- [“Using a Secure Shell Program from a Remote Workstation”](#)
- [“Using a Terminal Connected to the Serial Port”](#)

You can also access the CLI from the Web console, as described in [“Entering CLI Commands from the Web Console” on page 239](#).

### Using a Secure Shell Program from a Remote Workstation

Secure Shell (SSH) is an application program that provides authentication and encryption capabilities for secure Internet communications. You can download SSH client software from the following site:

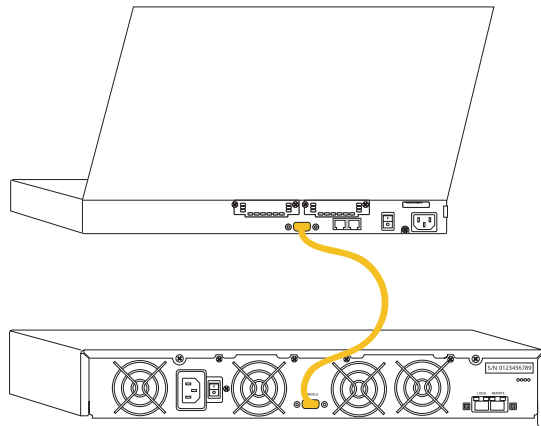
*<http://www.openssh.com>*

Because there are many different types of SSH applications available, it is recommended that you read the instructions for your specific SSH application.

## Using a Terminal Connected to the Serial Port

You can connect a terminal to the serial port on the Peribit device, and then use a terminal emulation program (such as HyperTerminal) to log in to the CLI and enter configuration commands. Some terminal emulation programs also include a Secure Shell.

Use a female/female DB-9 crossover cable (null-modem cable) to connect the serial port on the back of the Peribit device to the serial port on the terminal (Figure 11-1). The serial port is of type RS-232 (AT-compatible) with a male, DB-9 connector. The SR-15 and SR-20 include a crossover cable.



**Figure 11-1 Connecting a Terminal to a Peribit Device**

On the terminal, verify the following serial port settings:

- Baud rate: 9600 bps
- Data bits: 8
- Parity: none
- Stop bits: 1
- Flow control: none

## Logging In Using the CLI

Enter your user name and password to log in to the CLI. When a Peribit device is accessed for the first time, use **admin** and **peribit** for the user name and password.

The following prompt is displayed:

```
device#
```

Where *device* indicates the name of the Peribit device. To add or change the local user accounts, refer to [“Configure Security Command” on page 309](#).

## CLI Basics

Note the following about the CLI:

- CLI commands are case sensitive.
- To view the online help, type “help” before the command or type “?” after it. Type just “help” or “?” at the command prompt to view the available commands or options.
- All configuration changes are made to a staged “candidate” configuration, not the “running” configuration. Changes take effect only when you type “commit”. To retain your changes after the next reboot, type “save-config”.

---

**NOTE:** If you decide not to commit your changes, you must undo them manually or reboot the Peribit device to erase them. Otherwise, the next “commit” command or the next update in the Web Console will apply the changes to the running configuration.

---

- To view all of the settings for the running configuration, type the following:

```
show -run all
```

- To view a specific configuration setting, type the following:

```
show -run <configuration setting>
```

For example, to view the device IP address, subnet mask, and default gateway:

```
show -run ip
```

- To view settings for the candidate configuration, omit “-run” from the show commands.

Table 11-1 summarizes the keyboard shortcuts.

**Table 11-1 Keyboard Shortcuts**

Action	Shortcut	Description
Complete commands	<b>Tab</b> or <b>Ctrl+I</b>	Completes a partially typed keyword if enough characters are entered to uniquely identify it.
Recall commands	<b>Ctrl+P</b> or ↑	Retrieves the previous command from the history buffer.
	<b>Ctrl+N</b> or ↓	Retrieves the next command from the history buffer.
Delete characters	<b>Ctrl+D</b>	Deletes the character at the cursor.
	<b>Ctrl+H</b>	Deletes the character before the cursor (same as <b>Delete</b> key).
	<b>Ctrl+K</b>	Deletes all characters from the cursor to the end of the line.
	<b>Ctrl+W</b>	Deletes the word before the cursor.
	<b>Ctrl+U</b>	Deletes all characters on the line.
Move cursor	<b>Ctrl+A</b>	Moves the cursor to the start of the line.
	<b>Ctrl+B</b>	Moves the cursor back one character.
	<b>Ctrl+E</b>	Moves the cursor to the end of the line.
	<b>Ctrl+F</b>	Moves the cursor forward one character.
Transpose characters	<b>Ctrl+T</b>	Transposes the character at the cursor with the preceding character.
Exit configuration mode	<b>Ctrl+Z</b>	Returns to the top level of the CLI.

## Command Modes

When you log in to the CLI, the prompt is the device name followed by “#”, which indicates that you are at the top level of the command hierarchy (also called EXEC mode):

```
device#
```

System level configuration commands, such as “commit” and “save-config” can be entered only at this level.

Configuration commands for specific features can be entered on one line (“config ...”) or they can be entered in stages in configuration mode. For example, to change an interface setting, you can access configuration mode, which changes the prompt to indicate the mode:

```
device# config
device(config)#
```

You can now enter the rest of the command (“interface ...”) or access the interface sub-mode, which again changes the prompt to indicate the mode:

```
device(config)# interface
device(config-interface)#
```

By entering a “?” at each level, you can review the available options and complete the command in stages. To back up one level in the configuration, type **exit**. To return directly to the top level, press **Ctrl+Z**.

## CLI Show Commands

Table 11-2 lists the available “show” commands. These commands can be entered at any level.

**Table 11-2 CLI Show Commands**

Show	Description
<b>aaa</b>	Show authentication methods for the Console, Web, and CLI
<b>acceleration</b>	Show application acceleration configuration
<b>access-log</b>	Show management access log
<b>all</b>	Show all system configuration information
<b>application</b>	Show application definition
<b>arp</b>	Display ARP entries
<b>backup-sr</b>	Show backup mode configuration
<b>clock</b>	Display time related parameters
<b>connection</b>	Show list of current reducer connections
<b>console</b>	Show console (serial) port parameters
<b>contact</b>	Show contact information for the device
<b>filter</b>	Display the filter
<b>import-route-table</b>	Display import route table information
<b>interface</b>	Show network interface parameters
<b>ip</b>	Display the IP parameters



Table 11-2 CLI Show Commands (Continued)

Show	Description
<b>ipsec sa</b>	Show IPSec configuration and security associations
<b>license</b>	Show license information
<b>location</b>	Show location description for this system
<b>log</b>	Display system log
<b>mon-apps</b>	Show list of monitored applications
<b>multi-node</b>	Show multi-node parameters
<b>multi-node-status</b>	Show the status of multi-node configuration (master node only)
<b>multi-path</b>	Show multi-path configuration
<b>ospf</b>	Display OSPF parameters
<b>packet-capture</b>	Show packet capture parameters
<b>packet-interception</b>	Display packet interception parameters for off-path devices
<b>prime-time</b>	Show prime time settings
<b>profile-mode</b>	Show Profile Mode settings
<b>qos</b>	Show QoS parameters
<b>radius</b>	Show RADIUS configuration
<b>reduction</b>	Show reduction status
<b>reduction-subnet</b>	Show reduction subnet status
<b>reg-detail</b>	Show detailed information about the registration database
<b>reg-server</b>	Display registration server parameters
<b>reg-summary</b>	Show summary information about the registration database
<b>remote-routes</b>	Show remote route information
<b>rip</b>	Display RIP parameters
<b>route</b>	Display routing table
<b>route-poll</b>	Display routing poll table
<b>security</b>	Display security related parameters
<b>snmp</b>	Display SNMP related parameters
<b>sntp</b>	Display SNTP related parameters
<b>stack-group</b>	Show model and status of clients connected to an SR-100
<b>syslog</b>	Show Syslog parameters
<b>system</b>	Show general system information
<b>system-name</b>	Display the system name
<b>top-talker</b>	Show top-talker parameters
<b>uptime</b>	Show system uptime
<b>version</b>	Show version information

## Top-Level CLI Commands

This section describes the following top-level CLI commands. Note that the “ping” and “traceroute” commands can be entered at any level.

- [“Commit Command” in the next section](#)
- [“Configure Command” on page 250](#)
- [“Import Route Table Command” on page 251](#)
- [“Load Config Command” on page 251](#)
- [“Packet Capture Command” on page 252](#)
- [“Ping Command” on page 253](#)
- [“Reboot Command” on page 254](#)
- [“Rollback Command” on page 255](#)
- [“Save Config Command” on page 255](#)
- [“Set Command” on page 256](#)
- [“Shutdown Command” on page 256](#)
- [“Source Command” on page 256](#)
- [“Support Command” on page 257](#)
- [“Traceroute Command” on page 257](#)
- [“Upgrade Command” on page 257](#)
- [“Viewing System and Access Control Log Files” on page 258](#)

### Commit Command

The Commit command applies the “candidate” configuration to the “running” configuration. The candidate configuration is a staged configuration that includes all the configuration changes made since the last Commit command.

To commit the candidate configuration as the running configuration, type:

```
commit
```

### Configure Command

The Configure command is used to access the configuration commands. The command can be entered by itself or followed by specific configuration parameters:

```
config console set baud-rate <number>
```

## Import Route Table Command

You can import routes from a Cisco router if you first export the routes to a file, and save the file to an FTP or TFTP server. The routes displayed when you enter a “show ip route” command on the Cisco router are added to the local routes on the Peribit device.

The router must be in the same subnet as the Peribit device, and it is preferable to use the router connected to the Remote interface. The following types of imported routes are recognized:

**B** - BGP routes, **C** - Connected routes, **D** - EIGRP routes, **E** - EGP derived, **I** - IGRP derived, **i** - IS-IS derived, **O** - OSPF derived, **R** - RIP derived, **S** - Static routes

1. On the Cisco router, export the routing table and save it to an FTP or TFTP server.
2. To import the routing table from the FTP or TFTP server:

```
import-route-table route-file ftp://<IP address>[:<user>:<pass>]/<path and
file name>
```

or:

```
import-route-table route-file tftp://<IP address>/<path and file name>
```

The routing table is stored in the Flash memory and applied to the “candidate” configuration. You are prompted for the FTP user name and password if you omit them from the command line.

3. To delete the last imported route table file:

```
import-route-table delete
```

4. To commit the candidate configuration as the running configuration:

```
commit
```

## Load Config Command

Configurations can be saved and loaded at any time. The loaded configuration becomes the running configuration. You can also reload the factory default configuration, such as when you must move the device to another location, and securely wipe all data from the hard disks on a Sequence Mirror device.

To load a configuration using the CLI, the configuration must be stored in the Flash memory. Use the Web console to load a configuration from a local disk or an FTP or TFTP server, as described in [“Loading a Device Configuration File” on page 230](#).

---

**NOTE:** The configuration file contains information specific to the device, such as IP network settings. Therefore, you cannot load a configuration file from one device to another.

---

1. As a precaution, save the running configuration to an FTP or TFTP server, as described in [“Save Config Command” on page 255](#)
2. To load a device configuration file:

```
load-config <filename | factory-default [-wipe-disk <n>]> [-echo]
[-preserve-ip]
```

Where:

**filename.** Name of the configuration file (up to 8 characters) without the “.cfg” extension.

**factory-default -wipe-disk <n>**. Reloads the factory settings. On a Sequence Mirror device, you can include the “-wipe-disk” option to specify the number of passes used to perform a secure wipe of the hard disks. During each pass, a different value is written to each byte on the disks.

The first pass uses random numbers, the second pass writes a repeated pattern, the third pass uses zeros, the fourth pass writes another repeated pattern, while the fifth pass repeats the sequence with random numbers, shifted by one byte. Each pass takes about three hours (to stop the process, reboot the device). For maximum security, five passes are recommended. To view the progress of a secure wipe, enter the “show reduction” command.

When the reload is done, unplug the power cable from the back of the Peribit device, plug the cable back in, and then specify the IP address, subnet mask, and default gateway for the device.

---

**NOTE:** Restoring the factory default configuration removes all data, configuration information and log files. It also disrupts the reduction tunnels associated with this device. Before you restore the factory default configuration, you should back up the configuration file to another location (refer to [“Saving the Device Configuration” on page 227](#)).

---

**-echo.** Displays each command as it is executed.

**-preserve-ip.** Retains the device IP addresses when you reload the factory defaults.

3. Type “y” to confirm loading the configuration file.
4. To retain a loaded configuration when the device is restarted, save the configuration to *startup.cfg* in Flash memory:  
  

```
save-config
```
5. If a loaded configuration file changes the IP address, you **MUST** save the configuration to *startup.cfg*, and then reboot the device.

## Packet Capture Command

The Packet Capture feature lets you capture raw network data from the Local and/or Remote interfaces. The packet capture information can then be exported to a file and analyzed by a protocol analyzer program or other hardware. The format of the captured file is either “libpcap” or “snoop”.

You are prompted for the packet-capture password when you start or copy a packet capture. The default password is “peribit”. To change the password, refer to [“Configure Security Command” on page 309](#).

---

**NOTE:** Packet captures are logged in the Access Log file.

---

### 1. To start the Packet Capture:

```
packet-capture start interface <local | remote | both> size <number> [packets
<number>] [format <libpcap | snoop>] [snaplen <max size>] [savetime <time>]
```

Where:

- **<local | remote | both>**. Indicates the interfaces where data is collected.
- **size <number>**. Number of bytes to capture (4096 is the minimum).
- **packets <number>**. Maximum number of packets to capture.
- **format <libpcap | snoop>**. File format of the collected data. The default is libpcap.
- **snaplen <max size>**. Maximum number of bytes captured for each packet (0 to 65535). The default is 1514. A zero captures the entire packet.
- **savetime <time>**. Number of seconds that a completed packet capture is available in memory. The default is 3600.

### 2. To stop a packet capture:

```
packet-capture stop
```

### 3. To copy a packet capture to an FTP or TFTP server:

```
packet-capture copy ftp://<IP address>[:<user>:<pass>]/<path and file name>
[startpkt <number>] [numpkts <number>]
```

or:

```
packet-capture copy tftp://<IP address>/<path and file name> [startpkt
<number>] [numpkts <number>]
```

Where:

- **startpkt <number>**. Starting packet number. The default is “0”.
- **numpkts <number>**. Number of packets to copy in addition to the start packet. The default is zero, which copies all packets.

### 4. To delete the packet capture data:

```
packet-capture delete
```

## Ping Command

You can use the Ping utility to verify connections to other Peribit devices, or other devices in your network. To ping a Peribit device or other network device:

```
ping <IP address>
```

The results are displayed in the CLI.

## Reboot Command

If you load a new boot image of the system software, you must reboot the device. Rebooting the device loads the configuration information in the “startup.cfg” file, along with the current boot image. If you can reboot the device in Safe Mode, the power is on, and the device can be configured, but all traffic is passed through without reduction.

1. To immediately reboot the system:

```
reboot [-safe-mode] [-no-resync]
```

Where:

**-safe-mode.** Reboots the device so that the power is on, and the device can be configured, but all traffic is passed through without reduction. Note the following:

- The Ethernet ports are not enabled after the reboot, and the warning “ER SW Passthru” is displayed in the front panel
- To exit Safe Mode, enter the “reboot” command without the “-safe-mode” option.

**-no-resync.** Reboots the device and clears the reduction dictionary used for Network Sequence Monitoring. Available only on Sequence Mirror devices.

2. Type “y” to confirm that you want to reboot.
3. On an SR-15, if you issue the reboot command from a terminal connected to the serial port, the following options are displayed. You can enter a number (1 to 4) to specify the boot image to be loaded.
  1. **Primary image.** The most recent image loaded on the device (*srs.os*). If you do not select another boot image within a few seconds, the primary image is loaded.
  2. **Secondary image.** The previous image loaded on the device (*srs1.os*). If you have not upgraded the software on the device, the primary and secondary boot images are the same.
  3. **Recovery image.** The image loaded in the read-only area of Flash memory. Load the recovery image only if you suspect that the read/write area of Flash memory has been corrupted (it is loaded automatically if the primary and secondary images are not found). After the recovery image is loaded, you must:
    - a. Enter the IP address, subnet mask, and default gateway for the device. Skip all other Quick Setup prompts.
    - b. Use the “upgrade” command to load a full boot image on the device (refer to [“Upgrade Command” on page 257](#)). Do NOT use the recovery image for normal operation.
    - c. Reconfigure the device (the device configuration is reset to the factory defaults)
  4. **Specify boot image name.** If you have copied the primary or secondary image to another name on the device (for example, “copy srs.os test.os”), you can specify the name of the image to be loaded. Intended primarily for testing purposes.

## Rollback Command

The Rollback command is used to install a previous version of the SRS operating system. To rollback to a previous version of SRS, you must have the “.bin” or “.zip” file installed on an FTP or TFTP server in your network. You can also enter “rollback” without parameters to undo the outbound QoS settings in the candidate configuration. Before you rollback to a previous version of SRS, note the following device requirements:

- SR-20s require SRS 3.0 or greater.
- SR-80s require SRS 4.0 or greater.
- SR-15s, SR-100s, and SM-500s require SRS 5.0 or greater.
- SM-250s require SRS 5.0.8 or greater.
- If you rollback to a previous version of SRS, you will lose the features introduced in the later version (the associated settings in the configuration file are ignored).

---

**NOTE:** If you roll back SRS 5.0 to a previous version, all configuration data (except the IP information) will be reset to factory defaults. Always save the configuration file before upgrading to a new release so that you can reload the configuration after a roll back.

---

1. To rollback to a previous version of SRS:

```
rollback ftp://<IP address>[:<user>:<pass>]/<path and name of the SRS file>
```

or:

```
rollback tftp://<IP address>/<path and name of the SRS file>
```

2. Type “y” to confirm the rollback.
3. Reboot the device to activate the new software.

## Save Config Command

After you commit configuration changes, you must save the configuration if you want to preserve the settings the next time the device is rebooted. When you save the configuration through the CLI, it is stored in the Flash memory. Use the Web console to save the configuration to a local disk or an external FTP or TFTP server, as described in [“Saving the Device Configuration” on page 227](#).

---

**NOTE:** A configuration file contains information specific to the device, such as IP network settings. Therefore, you cannot load the configuration file from one device to another.

---

1. To view the current configuration:

```
show all
```

2. To save the configuration with the default name:

```
save-config
```

The configuration file is saved as *startup.cfg* and is used when you reboot the device.

3. To save the configuration with another name:

```
save-config <file name>
```

The name can be up to 8 characters. Do not include a file name extension (such as “.txt”).

4. Type “y” to confirm saving the configuration file.

## Set Command

The Set command lets you specify the device name, location, and an administrator's contact information. Text that includes spaces must be enclosed in double quotation marks.

1. To specify a device name (up to 30 characters):

```
set system-name <device name>
```

Do not use colons (:), asterisks (\*) question marks (?) or angle brackets (< >) in device names. Device name changes are propagated to the registration server the next time the device checks in with the registration server for updates.

2. To set an administrator contact information:

```
set contact <contact name, phone, etc.>
```

3. To set a location for the device:

```
set location <location>
```

## Shutdown Command

Run the Shutdown command before removing the power cord from a Peribit device.

1. To shut down the device:

```
shutdown [-reset-all] [-reset-monitor] [-reset-reg] [-reset-log] [-reset-  
access-log]
```

Where:

**-reset-all.** Resets everything (the default).

**-reset-monitor.** Resets the monitoring statistics.

**-reset-reg.** Resets the information from the registration server.

**-reset-log.** Deletes the system log files.

**-reset-access-log.** Deletes the access log files.

2. Type “y” to confirm the shutdown.

## Source Command

The Source command executes a file of configuration commands as if they were typed interactively. To execute a file of configuration commands:

```
source [-echo] <file path and name>
```

The file name can be up to 8 characters. The full path name is required, but the file name extension is optional. The `-echo` option displays each command as it is executed.



## Support Command

You can create a diagnostic file containing the current configuration, system information, filter settings, and log files. You can then email this file to Peribit Support to assist in the diagnosis of problems. The CLI command sends the diagnostic file to an FTP or TFTP server. Use the Web console to save the diagnostic file to a local disk, as described in [“Creating a Diagnostic File” on page 243](#).

1. To create a diagnostic file and copy it to an FTP or TFTP server:

```
support export <label> ftp://<IP address>[:<username>:<password>]/<path and file name>
```

or:

```
support export <label> tftp://<IP address>/<path and file name>
```

2. Press **Enter**.
3. Type a description for the file and press **Enter**.
4. Type “.” on a line by itself and press **Enter**.
5. When the command prompt returns, the file was successfully created and sent to the TFTP or FTP server. Make a copy of the file and send it to *support@peribit.com*.

## Traceroute Command

You can use the trace route utility to determine the number of router hops and the route taken from the current Peribit device to another device in your network. This tool can help you determine the point in your network that is causing a connection failure.

To run a trace route to a Peribit device or other network device:

```
traceroute <IP address>
```

The trace route results are displayed in the CLI.

## Upgrade Command

To upgrade the system software to a later version, you can load a new boot image of the SRS operating system from a TFTP or FTP server. Upgrading the system software does not affect the configuration information stored in the *startup.cfg* file. All configuration information is preserved.

---

**NOTE:** Your monitoring statistics may be corrupted if you use this command to install a previous version of the software. Always use the “rollback” command to restore a previous version of SRS (refer to [“Rollback Command” on page 255](#)).

---

1. To upgrade system software from an FTP or TFTP server:

```
upgrade ftp://<IP address>[:username:password]/<path and file name>
```

or:

```
upgrade tftp://<IP address>/<path and file name>
```

2. Type “y” to confirm upgrading the system software.
3. Reboot the device to activate the new software.

## Viewing System and Access Control Log Files

System and Access Control log files for the running configuration can be displayed in the CLI. The SR-50 stores 6 System log files, and 6 Access Control log files. Each system log file cannot exceed one MB in size. Each Access Control log file cannot exceed 20 KB in size. Depending on the amount of information that collects in the log files, each log file may be used for a single day, or today and the previous five days.

To view the system and access control log file:

1. To view the system log file:

```
show log [<n>]
```

Where <n> is the number of the log file (0 through 5). The default is log “0”, which has the latest entries.

2. To view the access control log file:

```
show access-log [<n>]
```

Where <n> is the number of the log file (0 through 5). The default is log “0”, which has the latest entries.

## File Management Commands

Standard commands are provided to view, copy, and remove files. These commands can be entered at any level.

### Copy Command

Use the Copy command to copy files on the Peribit device or between the device and an FTP or TFTP server.

1. To copy files between directories on the device:

```
copy <source path and file name> <destination path and file name>
```

If you omit the path name, the current directory is assumed.

2. To copy files between the device and a remote location, either the source or destination can be an FTP or TFTP server:

```
copy <full path and file name> ftp://<IP address>[:username:password]/<path and file name>
```

or:

```
copy tftp://<IP address>/<path and file name> <full path and file name>
```

You must specify the full path name on the device. If the user name or password includes a “#”, enclose the entire string in quotation marks. For example:

```
copy /ata0/cfg/startup.cfg "ftp://192.168.0.7:user1:pass#/startup.cfg"
```

## List Command

To list the files in a directory:

```
ls [<directory path>]
```

If you omit the directory path, the files in the current directory are listed.

## Remove Command

To delete a file on the device:

```
rm <path and file name>
```

If you omit the path name, the current directory is assumed.

## CLI Configuration Commands

- [“Configure AAA Command” in the next section](#)
- [“Configure Acceleration Command” on page 262](#)
- [“Configure Application Command” on page 265](#)
- [“Configure ARP Command” on page 267](#)
- [“Configure Backup Command” on page 268](#)
- [“Configure Clock Command” on page 269](#)
- [“Configure Console Command” on page 269](#)
- [“Configure Filter Command” on page 270](#)
- [“Configure Interface Command” on page 271](#)
- [“Configure IP Command” on page 273](#)
- [“Configure IPSec Command” on page 273](#)
- [“Configure License Command” on page 276](#)
- [“Configure Monitored Applications Command” on page 277](#)
- [“Configure Multi-Node Command” on page 277](#)
- [“Configure Multi-Path Command” on page 278](#)
- [“Configure OSPF Command” on page 281](#)
- [“Configure Packet Interception Command” on page 282](#)
- [“Configure Prime-Time Command” on page 284](#)
- [“Configure Profile Mode Command” on page 284](#)
- [“Configure QoS Inbound Command” on page 285](#)
- [“Configure QoS Outbound Command” on page 287](#)

- [“Configure RADIUS Command” on page 292](#)
- [“Configure Reduction Command” on page 293](#)
- [“Configure Reduction Subnets Command” on page 301](#)
- [“Configure Registration Server Command” on page 303](#)
- [“Configure Remote Routes Command” on page 304](#)
- [“Configure RIP Command” on page 305](#)
- [“Configure Route Command” on page 306](#)
- [“Configure Route Poll Command” on page 308](#)
- [“Configure Security Command” on page 309](#)
- [“Configure SNMP Command” on page 310](#)
- [“Configure Sntp Command” on page 311](#)
- [“Configure Stack-Group Command” on page 311](#)
- [“Configure Syslog Command” on page 312](#)
- [“Configure Top Talker Command” on page 313](#)

## Configure AAA Command

The AAA command is used to define up to 25 users, specify how users are authenticated to access the device through the Web, SSH (CLI), and the console. You can also enable or disable authorization checking. To define the RADIUS servers and server groups, refer to [“Configure RADIUS Command” on page 292](#).

1. To view the current AAA settings:

```
show -run aaa
```

2. Type the following command to enter the configure AAA mode:

```
config AA
```

3. To add a user account that can be authenticated locally:

```
user add name <name> [idle-timeout <seconds>] [privilege-level <read-only | read-write>]
```

Where:

- **name <name>**. User name (up to 32 characters). If the name includes spaces, enclose the name in quotation marks.
- **idle-timeout <seconds>**. Number of seconds before an idle user is logged out (the default is 1800). A zero indicates the user is never logged out. The timeout setting is ignored if authorization checking is disabled (see Step 5).
- **privilege-level**. Indicate whether the user has read-only or read-write access (the default is read-write). The read-only setting is ignored if authorization checking is disabled (see Step 5).

and then press **Enter**. Type the new password (from 4 to 64 characters) and press **Enter**, and then repeat to verify.

To change a user's password:

```
user set name <name> password
```

and then press **Enter**. Type the new password and press **Enter**, and then repeat to verify.

To change a user's idle timeout and/or access level:

```
user set name <name> idle-timeout <seconds> service-type <read-only | read-write>
```

To delete a user account:

```
user remove <name>
```

4. To specify up to four authentication methods for each management interface:

```
authentication set [console | ssh | web] [local | none | <server group>]
```

Where:

- **console | ssh | web**. Indicates the management interface (**ssh** is for Secure Shell access to the CLI).
- **local | none | <server group>**. Indicates whether users are authenticated locally by the device (the default), by a group of one or more RADIUS servers, or not at all. The **none** option is valid only for the console interface, and it can be used alone or after the last RADIUS group, but it cannot be used directly after **local**.

You can specify up to four methods (separated by spaces), which are then tried in the order specified. Authentication stops with the first success or failure. However, if **local** is the first method, the next method is tried if the user is not in the local database.

In the following command, if a user is not in the local database, the RADIUS servers in *group1* are tried in sequence. If none of them responds, the servers in *group2* are tried, and so on. If all of the RADIUS servers are down or do not respond, access is denied.

```
authentication aaa web local group1 group2 group3
```

5. By default, authorization checking is disabled, so that all authenticated users have read-write access and a 30-minute idle timeout. If you create read-only user accounts or change the default idle timeout, you must set authorization checking to "same-as-authentication".

```
authorization set mode aaa {off | same-as-authentication}
```

If RADIUS is used for authentication, but does not specify a privilege level or an idle timeout, all users have read-write privileges and a 30-minute idle timeout.

6. To specify the number of unsuccessful login attempts allowed on the SSH interface (1-10 or unlimited) before the user is disconnected (the default is three):

```
set login-retries {<number> | unlimited}
```

7. To commit the changes to the running configuration, exit configuration mode and type **commit**. To retain the changes the next time the device is restarted, type **save-config**.

## Configure Acceleration Command

The Acceleration command is used to configure Packet Flow Acceleration (PFA) for reduced TCP application traffic. PFA provides the following methods to accelerate TCP traffic in high-latency environments. For more information about PFA, refer to [“Overview of Packet Flow Acceleration” on page 177](#).

- **Flow Pipelining.** The sending Peribit device prompts the TCP source to send data faster by increasing the size of the TCP receive window. The receiving Peribit device stores and forwards data to the client, as needed. Intended for applications that do a large volume of data transfers, such as FTP and CIFS.
- **Fast Connection Setup.** The sending device locally acknowledges session requests for destinations known to be active. Intended for applications that have many short sessions, such as HTTP 1.0 and NetBios.
- **Active Flow Pipelining.** The sending and receiving Peribit devices terminate the TCP session and acknowledge all data transmissions locally. This results in three independent sessions—between the source and the sending device, between the two Peribit devices, and between the receiving device and the destination. Intended for applications that do a large volume of data transfers over satellite connections or other high-latency environments. On a given path between two devices, AFP cannot be used simultaneously with Flow Pipelining or Fast Connection Setup.
- **Forward Error Correction.** The sending Peribit device sends recovery packets along with the data so that the receiving device can reconstruct lost packets without requesting a retransmission. You can specify the number of recovery packets per block of data packets. Intended for use in high-loss, high-latency environments, such as satellite connections. When Active Flow Pipelining is enabled for an endpoint, FEC is enabled by default.

To accelerate traffic between two Peribit devices, the following conditions must be met:

- The selected applications must be reduced.
- A reduction tunnel must exist in both directions between the Peribit devices.
- Outbound QoS must be enabled using Weighted Fair Queuing or Weighted Strict Priority, and the WAN circuit speed must be specified for each remote Peribit device for which you want to accelerate traffic (refer to [“Configure QoS Outbound Command” on page 287](#)).
- All application traffic must traverse the same two Peribit devices in both directions. If the return traffic does not come back through the receiving device, packet acceleration will be ineffective. To verify that traffic is traversing the same Peribit devices in both directions, check the traffic flow sent and received counts in the Top Traffic report (refer to [“Viewing and Exporting Top Traffic Statistics” on page 222](#)).

---

**NOTE:** PFA is most effective in networks with high-speed connections and high latency. However, PFA may have no effect if traffic must traverse high-latency or low-speed connections that are one or more hops beyond the receiving Peribit device.

---

1. To view the current PFA configuration:

```
show -run acceleration
```

To clear the counters for Forward Error Correction:

```
config acceleration forward-error-correction clear counters
```

2. Type the following command to enter the configure acceleration mode:

```
config acceleration
```

3. To enable or disable the PFA methods to be used on one or more endpoints (all methods are disabled by default):

```
active-flow-pipelining set mode <on | off>
fast-connection-setup set mode <on | off>
flow-pipelining set mode <on | off>
forward-error-correction set mode <on | off>
```

To clear the counters for Forward Error Correction:

```
forward-error-correction clear counters
```

4. If you do not enable the same PFA methods for all endpoints (see Step 5), you can add each endpoint and specify its PFA methods (all methods are disabled by default). To add an endpoint, a reduction tunnel must exist for the device and outbound QoS must be configured correctly:

```
endpoint add ip-address <IP address> [mode <on | off>]
[active-flow-pipelining <on | off>] | {[fast-connection-setup <on | off>]
[flow-pipelining <on | off>] [forward-error-correction <on | off>
[data-pkts <4-25>] [recovery-pkts <0-5>]]}]
```

Where:

- **mode <on | off>**. Enables or disables the endpoint for PFA (disabled by default).
- **<method> <on | off>**. Enables or disables a PFA method. Active Flow Pipelining cannot be used with Flow Pipelining or Fast Connection Setup.
- **data-pkts <4-25> recovery-pkts <0-5>**. For Forward Error Correction, one recovery packet is sent for every nine data packets. Increasing the ratio of recovery packets to data packets reduces retransmissions, but requires more overhead. Zero recovery packets disables error correction.

Data packets must be a multiple of the recovery packets. For one recovery packet, the data packets can be 4 through 25; for 2 recovery packets, the data packets can be 4, 6, 8, and so on through 24.

To change the PFA settings for an endpoint:

```
endpoint set ip-address <IP address> [mode <on | off>]
[active-flow-pipelining <on | off>] | {[fast-connection-setup <on | off>]
[flow-pipelining <on | off>] [forward-error-correction <on | off>
[data-pkts <4-25>] [recovery-pkts <0-5>]]}]
```

To remove an endpoint from the list shown by the “show acceleration” command:

```
endpoint remove <IP address>
```

In the Web console, the endpoint is disabled, but is not deleted.

5. To use the same PFA methods for all endpoints, enable all endpoints (disabled by default):

```
set enable-all-endpoints on
```

To set or change the methods that apply to all endpoints (the “default” IP address indicates all endpoints):

```
endpoint set ip-address default [active-flow-pipelining <on | off>] |
{[fast-connection-setup <on | off>] [flow-pipelining <on | off>]
[forward-error-correction <on | off> [data-pkts <4-25>]
[recovery-pkts <0-5>]]}
```

Traffic is accelerated to all remote Peribit devices for which a reduction tunnel exists and outbound QoS is configured correctly. The specified PFA methods are applied to all qualifying endpoints, and to all qualifying endpoints added to the same Peribit community in the future. Note that the “mode” on/off setting does not apply to the “default” endpoint.

6. To specify the applications that use Fast Connection Setup:

```
fast-connection-setup application add <name>
```

To add an application that is included or excluded from Flow Pipelining or Active Flow Pipelining:

```
active-flow-pipelining application add <name>
flow-pipelining application add <name>
```

To indicate whether the specified applications are included or excluded from Flow Pipelining or Active Flow Pipelining (included by default):

```
flow-pipelining application mode {include | exclude}
active-flow-pipelining application mode {include | exclude}
```

Note that “include” mode excludes traffic for undefined applications.

To remove an application from the list shown by the “show acceleration” command:

```
active-flow-pipelining application remove <name>
fast-connection-setup application remove <name>
flow-pipelining application remove <name>
```

An application removed from the “include” list is shown as disabled in the Web console, but it is not deleted.

7. For optimum performance of Active Flow Pipelining, you can adjust the size of the buffer used to receive traffic. For example, if most of the traffic is sent from a hub to the spokes, you may want to adjust the buffer size on the spoke devices (default is “medium”).

```
active-flow-pipelining set buffer-size {small | medium | large | huge}
```

Where:

- **small.** Recommended for links with speeds of 512 Kbps (or higher) and round-trip-times under 150 ms, and for links under 512 Kbps and RTTs up to 300 ms.
- **medium.** Recommended for links with speeds of 512 Kbps (or higher) and round-trip-times from 150 to 600 ms, and for links under 512 Kbps and RTTs above 300 ms.
- **large.** Recommended for links with speeds of 512 Kbps (or higher) and round-trip-times from 600 to 1200 ms. Not recommended for slower links.
- **huge.** Recommended for links with speeds of 512 Kbps (or higher) and round-trip-times above 1200 ms. Not recommended for slower links.

---

**NOTE:** Larger buffer sizes use more memory, but smaller buffer sizes may restrict throughput. The recommended buffer sizes allow up to about 100 Mbps of unreduced throughput.

---



8. On a high-loss link, reduction may be terminated if heartbeat packets are lost. By default, when AFP or FEC is enabled for a remote endpoint, the local device stops reducing data for the remote device if it fails to respond to 15 consecutive heartbeats (passthrough mode). If 30 consecutive heartbeats get no response, the reduction tunnel to the remote device is disabled. The local device attempts to reestablish the tunnel every three minutes.

To increase the number of consecutive missed heartbeats that stop data reduction and disconnect the tunnel:

```
set heartbeat-misses passthru <number | default> disconnect <number | default>
```

This setting applies only to the remote endpoints for which AFP or FEC are enabled. To change the heartbeat settings for all other endpoints, refer to [“Configure Reduction Command” on page 293](#).

9. To commit the changes to the running configuration, exit configuration mode and type **commit**. To retain the changes the next time the device is restarted, type **save-config**.

## Configure Application Command

The Application command is used to manage application definitions. Application definitions allow Peribit devices to identify the traffic of up to 256 applications (the SR-15 is limited to 100). Definitions are provided for 20 applications with well-known port numbers. All other applications are grouped together as “Undefined” or “Others”. For each application you define, you can:

- Enable or disable data reduction. To conserve system capacity, you should disable reduction for applications whose traffic is encrypted or already compressed.
- Enable TCP acceleration (if data reduction is enabled).
- Assign the application to a traffic class to manage its outbound bandwidth allocation.
- View application reduction and acceleration statistics.

Each application definition can have up to five rules, and each rule can specify a protocol, source and destination port numbers (or range of port numbers), source and destination IP addresses or subnets, a ToS/DSCP value, and a URL or Citrix client and application name.

A packet matches an application definition if a match occurs on any of its rules. All the values defined in the same rule must be true for a match to occur on that rule. A packet is classified under the first application for which a rule match is found.

For a list of the default application definitions, refer to [Table 3-2 on page 90](#).

1. To view the current definitions for one or all applications:

```
show -run application [name]
```

2. Type the following command to enter the configure application mode:

```
config application
```

3. To add a rule to a new or current application definition, type (omit any option where you want a match to occur on any value):

```
rule add name <app> [src-port <number>] [dst-port <number>] [proto <string>]
[ip-precedence <number>] [src-addr <IP address>[/<mask>]]
[dst-addr <IP address>[/<mask>]] [dscp <number>] [url <string>]
[citrix-app <name>] [citrix-client <name>]
```

Where:

- **name <name>**. Application definition name. If the name includes spaces, enclose the name in quotation marks.
- **src-port <number>**. Source port number, a range of port numbers separated by a hyphen (-), or a series of comma-separated port numbers and ranges. For a list of common application port numbers, refer to [Appendix E, “Common Application Port Numbers”](#).
- **dst-port <number>**. Indicates the destination port (same format as the source port). Typically, source and destination ports are specified in separate rules so that a match occurs on packets that specify either port. A rule that includes both ports will match only packets that specify both ports.
- **proto <string>**. Indicates the protocol is “tcp”, “udp”, or a protocol number (0 to 134). To match on a URL or Citrix name, the protocol must be TCP. By default, a match can occur on any TCP or UDP packet. Any protocol you define by number becomes a default (like TCP and UDP) that applies to any rule that does not specify a protocol.
- **ip-precedence <number>**. ToS IP precedence value (0 to 7).
- **src-addr <IP address>[/mask]**. Source IP address or subnet.
- **dst-addr <IP address>[/mask]**. Destination IP address or subnet. Typically, source and destination addresses are specified in separate rules so that a match occurs on packets that specify either address. A rule that includes both addresses will match only packets that specify both addresses.
- **dscp <number>**. Differentiated Services Code Point (DSCP) value (0 to 63).
- **url <string>**. A URL of up to 127 characters. The general format is:

```
<host>/<uri>
```

Where:

<host> is up to eight strings separated by periods. You can use an asterisk (\*) by itself to indicate any string. For example:

```
www.peribit*.com
```

<uri> is up to eight strings separated by slashes. You can use an asterisk (\*) by itself to indicate any string. For example:

```
www.peribit*.com/*/index.htm
```

Note that an asterisk is treated as a single character when it is part of another string, such as “www.peribit\*.com”.

- **citrix-app** <name>. Name of a Citrix application.
  - **citrix-client** <name>. Name of a Citrix client.
4. When you add a new definition, it receives the next highest precedence value. Packets are compared against the definitions according to the precedence value (definitions with the lowest precedence values are checked first). The comparison stops on the first match, so if two definitions are similar, the more specific definition must have a lower precedence value. To change an application's precedence:
 

```
modify <application name> precedence <number>
```

The new value cannot exceed the current highest precedence value.
  5. To change an application rule, specify the application name and the rule ID of the rule you want to change (1 to 5):
 

```
rule modify name <name> rule-id <1-5> [src-port <number>] [dst-port <number>]
[proto <string>] [ip-precedence <number>] [src-addr <IP address>[/<mask>]]
[dst-addr <IP address>[/<mask>]] [dscp <number>] [url <string>]
[citrix-app <name>] [citrix-client <name>]
```

To delete a value from an application rule, specify a “-” for the value. The following example deletes the protocol so that a match can occur on any protocol:

```
rule modify name <application name> rule-id <1-5> proto -
```

To delete an entire rule:

```
rule remove name <application name> rule-id <1-5>
```
  6. To delete an application definition:
- ```
remove <application name>
```
7. To commit the changes to the running configuration, exit configuration mode and type **commit**. To retain the changes the next time the device is restarted, type **save-config**.

## Configure ARP Command

The ARP command is used to communicate with devices that do not respond to Address Resolution Protocol (ARP) requests. Using the ARP command, you can configure static ARP entries that map the IP addresses of those devices to their MAC addresses.

1. To view a list of static and dynamic ARP entries:
2. Type the following command to enter the configure ARP mode:

```
config arp
```

3. To add a new static ARP entry, type

```
add <IP address> <ethernet address> <local | remote>
```

Where <IP address> is the IP address, <ethernet address> is the MAC address, and <local | remote> indicates the Peribit device's Local or Remote interface.

4. To clear all dynamic ARP entries:

```
flush
```

5. To delete a static ARP entry:

```
remove <IP address>
```

6. To commit the changes to the running configuration, exit configuration mode and type **commit**. To retain the changes the next time the device is restarted, type **save-config**.

## Configure Backup Command

The Backup command allows a Peribit device to serve as a backup for up to 10 primary (active) Peribit devices. The backup downloads the configuration of each primary using SSL on TCP port 3577. The backup and primary devices exchange UDP heartbeats every 5 seconds on port 3578.

The backup device is activated when 12 heartbeats are missed. To activate the backup, the primary's configuration must be received at least once. An activated backup continues to send heartbeats to the failed primary, and returns to standby mode when the primary recovers.

No configuration is needed on the primary devices, and the primary devices can reside in different communities. The backup feature is supported for both in-line and off-path deployments, but the backup and primary devices must be the same type (an off-path primary cannot have an in-line backup).

Note the following when configuring a Peribit device as a backup:

- Load balancing must be disabled on all Peribit devices in the community that reduce data for any of the primary devices.
- The license of the backup device must match the "highest" license of the primary devices.
- Each device in the community that has reduction enabled for the primary devices should also enable reduction for the backup device.
- A backup device must be in the same data path as the primary devices. It is recommended that the backup and primary devices be on the same subnet. If a primary device uses static routes, the backup device **MUST** be on the same subnet.
- To back up a registration server, the backup device must be the secondary registration server. To back up devices in different communities, the backup device must belong to each community.
- Configuration changes to a primary device are exported to the backup device each hour. When a backup device is active, do not save the configuration. Changes to the backup configuration are **NOT** exported to the primary device.

To configure a backup device:

1. To view the current backup configuration:

```
show -run backup-sr
```

2. To enable or disable backup mode:

```
config backup-sr set mode <on | off>
```

3. To specify a primary device supported by this backup device:

```
config backup-sr remote-sr add <IP address>
```

4. To remove a primary device:

```
config backup-sr remote-sr remove <IP address>
```

5. To commit the changes to the running configuration, exit configuration mode and type **commit**. To retain the changes the next time the device is restarted, type **save-config**.

## Configure Clock Command

If an NTP server is used to set device times in your network, refer to “[Configure SNTP Command](#)” on page 311. If your network does not use an NTP server, you should manually configure the time settings for each Peribit device. The date and time is saved with each entry in the system log files, which can help you troubleshoot problems if they arise.

1. To view the current clock settings:

```
show -run clock
```

2. Type the following command to enter the configure clock mode:

```
config clock
```

3. To set the data and time:

```
set time <YYYYMMDDhhmm>
```

For example, to set the time to 12:30 p.m. March 16, 2003:

```
set time 200303161230
```

4. To set the time zone for the device:

```
set location <id>
```

Where <id> is the ID number of the time zone (1 to 74). To view the list of time zones included in the help, enter:

```
set location ?
```

5. To set daylight savings time on (if applicable):

```
set daylight-saving on
```

6. To commit the changes to the running configuration, exit configuration mode and type **commit**. To retain the changes the next time the device is restarted, type **save-config**.

## Configure Console Command

You can configure the baud rate for the DB9 console port on the back of the Peribit device. The default baud rate is 9600.

1. To view the current baud rate:

```
show -run console
```

2. To set the baud rate:

```
config console set baud-rate <number>
```

3. To commit the changes to the running configuration, exit configuration mode and type **commit**. To retain the changes the next time the device is restarted, type **save-config**.

## Configure Filter Command

By default, all applications running over TCP or UDP (except HTTPS, SNMP, and SSH) are enabled for data reduction. You can use the Filter command to specify applications, protocols, or source and destination address pairs that you want to include or exclude from reduction. You can also disable the reduction of packet fragments. Note that a source/destination filter, which applies to all traffic, is applied before the application filter, and is more efficient.

For example, to conserve system capacity, you should exclude applications whose traffic is encrypted or already compressed because the reduction will be minimal. Note that applications must be defined before they can be filtered. To create application definitions, refer to [“Configure Application Command” on page 265](#). Undefined applications are reduced by default.

1. To view the current filter settings:

```
show -run filter
```

2. Type the following command to enter the configure filter mode:

```
config filter
```

3. To include or exclude one or more applications from data reduction:

```
add application <name1 name2 ...>
```

Names that include spaces must be enclosed in quotation marks. Multiple applications must be separated by commas (no spaces). Use the `show application` command to view the names of your currently defined applications.

Indicate whether the specified applications are included or excluded from data reduction:

```
set mode-applications <off | include | exclude>
```

Set the mode to “off” to reduce all applications (the default).

To remove one or more applications from the filter:

```
remove application <name1 name2 ...>
```

4. To include or exclude all traffic between two addresses or subnets:

```
add bi-address-pair <IP address>[/<mask>]-<IP address>[/<mask>]
```

An asterisk (\*) can be used alone (no subnet mask) to indicate any IP address, such as “\*-192.168.1.2”.

To include or exclude traffic in just one direction:

```
add address-pair <from IP address>[/<mask>]-<to IP address>[/<mask>]
```

Indicate whether the address pairs are included or excluded from data reduction:

```
set mode-address-pair <off | include | exclude>
```

Set the mode to “off” to reduce traffic between all eligible addresses (the default).

To remove one or all address pairs from the filter:

```
remove address-pair {all | <IP address>[/<mask>]-<IP address>[/<mask>]}
```

5. To enable or disable the reduction of packet fragments:

```
set ip-fragments {on | off}
```

All packet fragments are reduced by default. Fragments may not be associated with the correct application, but disabling reduction may cause fragments to arrive before the reduced packets that should precede them.

6. To commit the changes to the running configuration, exit configuration mode and type **commit**. To retain the changes the next time the device is restarted, type **save-config**.

## Configure Interface Command

The Interface command lets you set the interface speeds and duplex modes, run a test to detect a mode mismatch on the Local or Remote interface, enable the reduction of VLAN traffic that adheres to the IEEE 802.1Q specification, and reset the interface traffic statistics to zero.

In addition, you can enable high-availability support so that when a failure is detected on one interface, the other interface is turned off. This allows the switch or router to detect the failure, and ensures that the routing mechanisms work as expected.

1. To view the Local and Remote interface configuration and traffic statistics:

```
show -run interface -verbose
```

2. Type the following command to enter the configure interface mode:

```
config interface
```

3. To reset the Local or Remote interface statistics to zero:

```
reset-stats <local | remote>
```

4. To set the speed and duplex mode setting for the Local or Remote interface (Gigabit speeds are available for the SR-55 and SR-80):

```
set speed-duplex local <auto | 10-half | 10-full | 100-half | 100-full> |  
<1000-full>
```

```
set speed-duplex remote <auto | 10-half | 10-full | 100-half | 100-full> |  
<1000-full>
```

The fiber-optic SR-80 interfaces support only 1000 Mbps with full-duplex.

5. To enable link status propagation from the Local interface to the Remote interface:

```
set propagate-failure local-to-remote on
```

If the switch fails, the Remote interface is turned off so that the router can detect the loss of connectivity with the switch.

To enable link status propagation from the Remote interface to the Local interface:

```
set propagate-failure remote-to-local on
```

If the router fails, the Local interface is turned off so that the switch can detect the loss of connectivity with the router.

Specify the number of seconds that the interface is shut down (the default is 15) or use “forever” to shut down the interface indefinitely:

```
set down-time local-to-remote <seconds | forever>  
set down-time remote-to-local <seconds | forever>
```

6. To test the duplex settings between the local or remote interface and an IP address:

```
test <local | remote> <IP address>
```

This test sends test packets to the specified IP address.

7. To enable or disable a periodic test of the duplex settings on both interfaces (enabled by default):

```
set enable-periodic-test <on | off>
```

This test does not send any packets. If mismatched duplex settings are detected, an error message is displayed above the menu frame in the Web Console, and when you log in to the CLI. A mismatch can be detected only when data is sent and received at the same time.

8. To enable or disable the reduction of 802.1q VLAN traffic (disabled by default):

```
set vlan mode <on | off>
```

To specify the default VLAN ID (1 through 4095) used for untagged frames in the VLAN environment where the Peribit device is installed:

```
set vlan native-id <1-4095>
```

Specify the VLAN ID (1 through 4095) for the port where the Local interface of the Peribit device is connected. On ports that have multiple VLANs, specify the VLAN that has the largest number of hosts.

```
set vlan id <1-4095>
```

To preserve the VLAN ID in the header of reduced packets for routers that use the ID for QoS, MPLS, or other functions (disabled by default):

```
set vlan preserve <on | off>
```

In some VLAN environments, local routes may be discovered on the WAN side of the device. To add WAN-side routes to the list of reduction subnets, enable the WAN reduction subnet option (refer to [“Configure Reduction Subnets Command” on page 301](#)).

9. To commit the changes to the running configuration, exit configuration mode and type **commit**. To retain the changes the next time the device is restarted, type **save-config**.



## Configure IP Command

During the installation process, you entered an IP address, subnet mask, and a default gateway so that the Peribit device can communicate with other devices in your network. You can use the following CLI commands to change any of these settings.

1. To view the current IP address, subnet mask, and gateway:

```
show -run ip
```

2. Type the following command to enter the configure IP mode:

```
config ip
```

3. To set the IP address for the device:

```
set ip-address <IP address>
```

4. To set the subnet mask for the device:

```
set subnet-mask <subnet mask>
```

5. To set the default gateway for the device:

```
set default-gateway <gateway ip address>
```

6. To commit the changes to the running configuration, exit configuration mode and type **commit**. To retain the changes the next time the device is restarted, type **save-config**.

---

**NOTE:** If you change the IP address or subnet mask, you must reboot the device. Also, if this device is a registration server, you must first transfer the registration server to another Peribit device before changing the IP address (refer to [“Configure Registration Server Command” on page 303](#)).

---

## Configure IPSec Command

IP security (IPSec) can be used to authenticate and encrypt traffic between any pair of Peribit devices (endpoints) in the same community. IPSec must be enabled on both devices, and both devices must be configured with the same pass phrase (preshared key) and security algorithms. Encryption can also be enabled based on the traffic path (refer to [“Configure Multi-Path Command” on page 278](#)). Each Peribit device can encrypt traffic for up to 100 other Peribit devices (the SR-15 and SR-20 are limited to two and five devices, respectively).

When IPSec is enabled, all compressed and passthrough traffic destined for the peer device is encrypted. For traffic sent to unadvertised subnets (no remote Peribit device), you can define a default IPSec policy that specifies the remote subnets for which traffic is sent unencrypted or dropped and logged.

To manage IPSec configurations, you define templates that specify the security algorithms and key lifetimes for outgoing traffic, and then apply a template to each of the remote Peribit devices that support IPSec. The predefined template named “Wizard” has the following properties:

- **Encryption.** Advanced Encryption Standard with a 128-bit key (AES-128)
- **Authentication.** Secure Hash Algorithm (HMAC/SHA-1)
- **Key lifetimes.** Keys are limited to 24 hours or 100 MB of traffic.

When you configure IPSec for the first time, you should use the Setup Wizard (refer to [“Using the IPSec Setup Wizard” on page 191](#)). The Setup Wizard updates the Wizard template.

To change the IPSec settings:

1. To view the current IPSec settings:

```
show -run ipsec [sa [<ip-address>]]
```

Where:

- **sa [<ip-address>]**. Displays the inbound and outbound security associations (SAs) for each endpoint or just the specified endpoint. Each SA specifies the algorithms and generated keys used to protect traffic in one direction. The SA information includes:
  - **SA Index**. Number that identifies each SA, also called the Security Parameter Index (SPI). To establish a secure connection, the outbound SA index on the sender must match an inbound SA index on the receiver.
  - **State**. Indicates whether an SA is “mature” (active) or “dying” (the key lifetime has expired). A new SA is negotiated when the key lifetime reaches 80% of the time limit or 50% of the data limit. After the first key expires, each endpoint has four SAs: two active (inbound and outbound) and two that are “dying.”
  - **Sequence #**. Indicates the sequence number of the last packet received. A packet is dropped if its sequence number is a duplicate or is not within 32 of the last received sequence number. Used for anti-replay protection.

2. Type the following command to enter the configure IPSec mode:

```
config ipsec
```

3. To enable or disable IPSec (disabled by default):

```
set mode <on | off>
```

4. To add a new IPSec template (only the name is required):

```
template add name <name> [key-time-lifetime <hours>] [key-data-lifetime <MB>]
[encryption any | AES-128 | AES-192 | AES-256 | 3DES] [authentication any | HMAC/
SHA-1 | HMAC/MD5]
```

Where:

- **name <name>**. Template name (up to 20 characters). If the name includes spaces, enclose the name in quotation marks.
- **key-time-lifetime <hours>**. Number of hours (up to 2160) before the generated security keys are renegotiated (default is 24). A zero indicates that the keys have no time limit.
- **key-data-lifetime <MB>**. Number of megabytes of traffic (up to 4000) before the generated security keys are renegotiated (default is 100). A zero indicates that the keys have no data limit. If both lifetimes are set, keys are renegotiated when 75% of either limit is reached.
- **encryption any | AES-128 | AES-192 | AES-256 | 3DES**. Algorithm used to encrypt outbound traffic. Specify “any” to use the algorithm selected for the other endpoint. If both endpoints specify “any,” AES with a 128-bit key is used (the default). Note that triple Digital Encryption Standard (3DES) is slower and less secure than AES.

- **authentication any | HMAC/SHA-1 | HMAC/MD5**. Algorithm used to authenticate outbound traffic. Specify “any” to use the algorithm selected for the other endpoint. If both endpoints specify “any,” HMAC/SHA-1 is used (the default). HMAC/SHA-1 provides more security, but HMAC/MD5 is two to three times faster.

To change a template, specify the template name and the settings you want to change:

```
template set name <name> [new-name <name>] [key-time-lifetime <hours>]
[key-data-lifetime <MB>] [encryption any | AES-128 | AES-192 | AES-256 | 3DES]
[authentication any | HMAC/SHA-1 | HMAC/MD5]
```

To delete an IPSec template:

```
template remove <name>
```

If the deleted template was applied to an endpoint, the endpoint reverts to the Wizard template. The Wizard template can be changed, but not deleted.

5. To assign an IPSec template to a remote endpoint:

```
endpoint add ip-address <address> [template <name>] [mgmt-traffic-mode <on |
off>] [pass-phrase]
```

Where:

- **ip-address <address>**. IP address of a Peribit device that supports IPSec.
- **template <name>**. Name of an IPSec template (default is “Wizard”).
- **mgmt-traffic-mode <on | off>**. Indicates whether management traffic for the remote endpoint is encrypted (disabled by default). Should be disabled during testing. Management traffic includes SNMP, Syslog, and registration server traffic.
- **pass-phrase**. Prompts you for a password when you press **Enter**. The password is used to generate a pre-shared key of the appropriate length. Type the pass phrase (4 to 64 characters), press **Enter**, and then repeat to verify. The same pass phrase must be specified on the remote device.

Alternatively, you can specify the same pass phrase for all endpoints:

```
set common-pass-phrase
```

and press **Enter**. Type the password (at least four characters), press **Enter**, and then repeat to verify. You must then enable the common pass phrase (disabled by default):

```
set common-pass-phrase-mode <on | off>
```

To change an endpoint, specify the endpoint address and the settings you want to change:

```
endpoint set ip-address <address> [template <name>] [mgmt-traffic-mode <on |
off>] [pass-phrase]
```

To disable IPSec for an endpoint:

```
endpoint remove <IP address>
```

Traffic to a deleted endpoint will be unencrypted.

6. The default IPSec policy is applied to traffic sent to unadvertised subnets (no remote Peribit device), and to traffic between Peribit devices where IPSec is enabled, but the key negotiation has failed. By default, all such traffic is unencrypted.

To add a destination address or subnet to the default policy for which traffic must be dropped and logged:

```
encrypt-required-subnets add <address>[/mask]
```

After you verify that IPSec is working correctly, all subnets advertised IPSec-enabled peers should be added to the encryption-required list to avoid sending unencrypted traffic to those subnets if a remote Peribit device fails.

To specify an address or subnet where encryption is optional:

```
encrypt-optional-subnets add <address>[/mask]
```

For example, if subnet 10.10.0.0/255.255.0.0 is specified as encryption required, you can specify one or more smaller subnets in that range where encryption is optional, such as 10.10.20.0/255.255.255.0. If an address or subnet is in both lists, the traffic is sent unencrypted.

To remove a required or optional subnet from the default policy:

```
encrypt-required-subnets remove <address>[/mask]
```

```
encrypt-optional-subnets remove <address>[/mask]
```

7. To commit the changes to the running configuration, exit configuration mode and type **commit**. To retain the changes the next time the device is restarted, type **save-config**.

## Configure License Command

Each Peribit device requires a permanent license key for operation. The license key determines the throughput levels for the device, and properly registers the product with Peribit Networks. By default, each device uses a 30-day evaluation license. When the evaluation license expires, the device stops reducing data.

The license key is based on the device serial number, located on the back of the device. After you have the serial number, you can have a permanent license key emailed to you from Peribit's Online License Key server. The License Key server is accessible by clicking the **Online Service** button in the License Key page of the Web console, or by going to <http://license.peribit.com>. If you do not have Internet access, please call Peribit Support at 1-866-Peribit (866-737-4248) or +1-408-330-5600.

To enter a new license key:

1. To view the current license:

```
show -run license
```

2. Type the following to enter the config license key mode:

```
config license
```

3. Enter the new license key:

```
set license-key <new license key>
```

## Configure Monitored Applications Command

If a reduced application is also monitored, you can view data reduction and acceleration statistics for the application. By default, applications that are reduced are also monitored. You can monitor up to 40 reduced applications. For more information about monitoring statistics, refer to [“Viewing Results” on page 201](#). Use the following commands to select specific applications to be monitored.

Application definitions are provided for 19 applications with well-known port numbers. All other applications are grouped together as “Undefined” or “Others”. If the undefined applications are reduced, they are monitored automatically. To define additional applications, refer to [“Configure Application Command” on page 265](#).

---

**NOTE:** If you disable monitoring for a reduced application, its historical monitoring statistics are moved to the “Others” application category on the reduction reports. If monitoring is re-enabled, the historical statistics remain in the “Others” category.

---

1. To view the applications being monitored:

```
show -run mon-apps
```

2. Type the following command to enter the configure monitored applications mode:

```
config mon-apps
```

3. To clear the current list of monitored applications:

```
clear
```

To specify one or more applications to be monitored:

```
add <application1 application2 ...>
```

Multiple applications must be separated by spaces. If an application name contains spaces, enclose the entire name in quotation marks.

To remove one or more applications from the monitoring list:

```
remove <application1 application2 ...>
```

4. To specify whether traffic reports show application port names for reserved port numbers (up to 1024) or all port numbers (the default is “all”):

```
set port-map <all | reserved>
```

5. To commit the changes to the running configuration, exit configuration mode and type **commit**. To retain the changes the next time the device is restarted, type **save-config**.

## Configure Multi-Node Command

In multi-node configuration, Peribit devices work in conjunction to provide greater reduction of data on higher-speed or heavily congested networks. For more information on installing and administering multi-node configurations, refer to [“Multi-Node Configurations” on page 315](#).

## Configure Multi-Path Command

If a pair of Peribit devices has two possible WAN paths between them, you can designate one path as the primary and the other as the secondary. Selected traffic can be sent over a preferred path under normal conditions, and dynamically switched to the alternate path when the preferred path fails or when congestion or latency exceed a specified threshold. Note that each Multi-Path endpoint counts as two reduction tunnels.

For example, if you normally send database traffic over Frame Relay, and email traffic over the Internet, you can automatically divert the database traffic to the Internet if Frame Relay fails, and divert email traffic to Frame Relay if the Internet becomes congested. Traffic is switched back to the preferred path when conditions return to normal.

To use Multi-Path, you must:

- Configure a secondary source IP address to be used for outgoing packets intended for the secondary path. You can also specify a primary and secondary gateway address or ToS/DSCP value. Note that ToS/DSCP values override the ToS/DSCP settings defined for outbound QoS.
- Define templates that specify the preferred path (primary or secondary) for each outbound QoS traffic class and the conditions when the traffic for each class can be switched.
- Apply a template to the remote Peribit devices that support Multi-Path, and specify the congestion and latency thresholds for each path to the remote device.
- If necessary, configure the WAN routers to route the marked packets to the appropriate path.

Note that data reduction must be enabled on each Peribit device that supports Multi-Path (refer to [“Configure Reduction Command” on page 293](#)). Encryption can be enabled for one or both paths (refer to [“Configure IPSec Command” on page 273](#)).

1. To view the current multi-path settings:

```
show -run multi-path
```

To view the last 32 events when traffic was switched between primary and secondary paths:

```
show multi-path events [<address>]
```

2. Type the following command to enter the configure multi-path mode:

```
config multi-path
```

3. To enable or disable multi-path processing (disabled by default):

```
set mode <on | off>
```

4. On the subnet where the Peribit device is installed, reserve a unique secondary IP address to be used as the source address on packets sent on the secondary path (on packets sent on the primary path, the device address is the source address). To specify the secondary address:

```
set sec-ip-address <address>
```

---

**NOTE:** If you must change the secondary address, enter “set mode off” and “commit” commands, and then enable Multi-Path again and specify the new address.

---

Optionally, packets sent on the primary and secondary paths can be marked with different ToS/DSCP values or gateway addresses. You can specify values for both marking methods, but only one method can be used for each endpoint.

If the WAN routers for the primary and secondary paths are on the same subnet as the Peribit device, enter their IP addresses. In this case, no additional router configuration is needed. To specify primary and secondary gateway addresses:

```
set gateway-ip <primary-address> <secondary-address>
```

If the WAN routers for the two paths are on separate subnets, the default gateway must be configured to route traffic to the appropriate WAN link (refer to [“Configuring Routers to Support Multi-Path” on page 121](#)).

To specify primary and secondary ToS IP precedence values (0 to 7) or DSCP values (0 to 63), set the mode (default is IP precedence), and then set an IP precedence or DSCP value:

```
set ip-precedence-dscp-mode <ip-precedence | dscp>
set ip-precedence <primary> <secondary>
set dscp <primary> <secondary>
```

**NOTE:** These values override the IP precedence or DSCP settings defined for:

- Outbound QoS (refer to [“Configure QoS Outbound Command” on page 287](#))
- Peribit control packets (refer to [“Configure Reduction Command” on page 293](#))

Also, multi-path DSCP values override ToS type-of-service settings used for Cisco router balancing (refer to [“Configure Route Command” on page 306](#))

##### 5. To add a new multi-path template:

```
template add name <name>
```

Where:

- **name <name>**. Template name (up to 20 characters). If the name includes spaces, enclose the name in quotation marks.

By default, a new template specifies that each QoS traffic class uses the primary path and is never switched to the alternate path. To change the preferred path and bypass condition for a traffic class:

```
template class set name <name> class-name <name> [preferred-path <primary | secondary>] [bypass-condition <never | failure-only | performance-failure>]
```

Where:

- **name <name>**. Template name. If the name includes spaces, enclose the name in quotation marks.
- **class-name <name>**. Traffic class name. To view the current traffic classes, enter the “show qos outbound” command. To add a new traffic class, refer to [“Configure QoS Outbound Command” on page 287](#).
- **preferred-path <primary | secondary>**. Indicates the default path used by the traffic class (default is primary).
- **bypass-condition <never | failure-only | performance-failure>**. Indicates when this traffic class is switched: never, only when the other path fails, or when the path fails or the specified congestion or latency thresholds are exceeded (default is never).

To change a template name:

```
template set name <name> new-name <name>
```

To delete a multi-path template:

```
template remove <name>
```

A template assigned to an endpoint cannot be deleted until the endpoint is deleted.

**6. To apply a multi-path template to a remote endpoint:**

```
endpoint add ip-address <address> template <name> [marking-method <ip-only |  
gateway-ip | tos-dscp>]
```

Where:

- **ip-address <address>**. IP address of a remote Peribit device that supports multi-path processing.
- **template <name>**. Name of a multi-path template.
- **marking-method <ip-only | gateway-ip | tos-dscp>**. Indicates whether packets on the primary and secondary paths are distinguished only by the source IP address (the default) or also by the gateway IP address or ToS/DSCP value specified in Step 4.

To change an endpoint's template and/or marking method:

```
endpoint set ip-address <address> [template <name>] [marking-method <ip-only  
| gateway-ip | tos-dscp>]
```

To disable multi-path processing for an endpoint:

```
endpoint remove <IP address>
```

**7. To change the default loss and latency thresholds for the primary or secondary paths to a remote endpoint:**

```
endpoint path set ip-address <address> latency-tolerance <20-5000>  
probes-per-minute <1-60> probes-above-latency <1-60> probes-lost <1-60>  
minutes-to-divert-la <1-32> minutes-to-divert-lo <1-32>  
minutes-to-return-la <1-32> minutes-to-return-lo <1-32>
```

Where:

- **ip-address <address>**. Primary or secondary IP address of a remote Peribit device that supports multi-path processing.
- **latency-tolerance <20-5000>**. Latency in milliseconds that must be exceeded before traffic is switched to the alternate path (default is 5000).
- **probes-per-minute <1-60>**. Number of times per minute that the path is tested (default is 12).
- **probes-above-latency <1-60>**. Number of times per minute that the latency threshold must be exceeded before the minute is marked as above the threshold (default is 4).
- **probes-lost <1-60>**. Number of probes that must be lost per minute before the minute is marked as above the loss threshold (default is 2).
- **minutes-to-divert-la <1-32>**. Number of consecutive minutes that must exceed the latency threshold before traffic is switched to the alternate path (default is 4).



- **minutes-to-divert-lo <1-32>**. Number of consecutive minutes that must exceed the loss threshold before traffic is switched to the alternate path (default is 4).
  - **minutes-to-return-la <1-32>**. Number of consecutive minutes of acceptable latency required before traffic is switched back to the primary path (default is 4).
  - **minutes-to-return-lo <1-32>**. Number of consecutive minutes of acceptable loss required before traffic is switched back to the primary path (default is 4).
8. To commit the changes to the running configuration, exit configuration mode and type **commit**. To retain the changes the next time the device is restarted, type **save-config**.

## Configure OSPF Command

If your network uses OSPF, you can enable OSPF support on the Peribit device. The OSPF routes on the local side of the device are discovered and added to the Local Routes table.

1. To view the current OSPF settings:

```
show -run ospf
```

2. Type the following command to enter the configure OSPF mode:

```
config ospf
```

3. To enable or disable OSPF:

```
set ospf <on | off>
```

4. To enter an OSPF area ID:

```
set area <IP address in dotted-decimal notation or a number>
```

5. To specify the type of OSPF authentication (the default is none):

```
set auth-type <crypt | password | none>
```

If you set OSPF authentication to “crypt,” specify the MD5 key ID (1 to 255) and encryption key (up to 16 characters):

```
set crypt <key-id> <key>
```

If you set OSPF authentication to “password,” specify the password (up to 8 characters):

```
set password <password>
```

6. To change the number of seconds (1 to 65535) between the sending of OSPF hello packets (the default is 10):

```
set hello-interval <number>
```

To change the number of seconds (1 to 65535) before adjacent routers assume the Peribit device is down when no hello packets are received (the default is 40):

```
set dead-interval <number>
```

7. To commit the changes to the running configuration, exit configuration mode and type **commit**. To retain the changes the next time the device is restarted, type **save-config**.

---

**NOTE:** If you change the dead interval, you must stop and restart the OSPF service for the change to take effect.

---

## Configure Packet Interception Command

If the Peribit device is deployed off-path, where only the Local port is connected to the network, you can use one of the following methods to route traffic to the Local port for reduction.

- **Route injection.** The Routing Information Protocol (RIPv2) is used to advertise the off-path Peribit device as the lowest cost “router” for the remote routes advertised by the other devices in the Peribit community. Requires that surrounding routers give the highest priority to RIP routes. When RIP is used, note the following:
  - To advertise the subnet where a remote Peribit device is installed, several new subnets are generated to exclude the IP address of the remote device. This prevents the router from returning the traffic tunneled to the remote device.
  - The off-path Peribit device has no passthrough data. Both reduced and unreduced traffic is sent through the reduction tunnel.
- **WCCP.** The Web Cache Communication Protocol is used to redirect specific types of traffic from the router to the off-path device. The router must support WCCP version 2. Refer to the sample router commands in [“WCCP Router Configuration Commands” on page 109](#).
- **External.** The WAN edge router is configured to route traffic to the off-path device. The off-path device must be connected directly to the router. Refer to the sample router commands in [“External Policy-Based Router Commands” on page 110](#).

In each case, the redirected traffic is reduced (if eligible) and returned to the WAN edge router over the Local interface. Note that off-path Peribit devices do not support multi-node configurations. Also, outbound bandwidth management is limited to the WAN traffic that is routed through the off-path device.

1. To view the current packet interception settings:

```
show -run packet-interception
```

2. Type the following command to configure off-path interception:

```
config packet-interception
```

3. To enable or disable off-path interception (disabled by default):

```
set mode {rip | wccp | external | off}
```

---

**CAUTION:**Enabling packet interception disables the Remote interface. If the Peribit device is installed in the data path, data transmission through the device will stop.

---

4. If you enable RIP, you can specify the frequency of RIP updates, the delay between each route in an update, and the cost (metric) assigned to each route.

- a. To change the number of seconds between RIP updates (the default is 30):

```
rip set update-timer <1-7200>
```

Must match the update timer set on the router.

- b. To reduce the load on slower routers, you can specify a delay between each packet in a RIP update (default is 0). To specify the number of milliseconds between each packet (0 through 50):

```
rip set delay <0-50>
```

- c. Each route has a default metric (cost) of two. To change the metric (1 through 15):

```
rip set metric <1-15>
```

5. If you enable WCCP, you must specify the router IP address, authentication, WCCP priority, and a service ID for each protocol whose traffic you want redirected to the off-path device.

- a. To specify the router address:

```
wccp set router-ip-address <iP address>
```

- b. If the Cisco router requires a WCCP password:

```
wccp set auth-type password
```

To specify the password:

```
wccp set password
```

At the prompts, enter and verify the password.

- c. A WCCP priority value (0 through 255) is required to indicate the order in which packets are compared against the services (protocols) you specify, relative to the other services redirected by the router. Higher values have a higher priority. The default is 230. To specify the WCCP priority:

```
wccp set priority <0-255>
```

For example, if the router is redirecting HTTP traffic to a WEB cache using priority 240, and you want to redirect all TCP traffic to the off-path device, specify a lower priority to avoid “stealing” traffic from the Web cache.

- d. To specify a protocol whose traffic you want redirected to the off-path device:

```
wccp protocol add {tcp | udp | <protocol-number>} <service-id>
```

Where:

**<protocol-number>**. IP protocol number (0 to 255). The standard protocol numbers are listed at: <http://www.iana.org/assignments/protocol-numbers>.

**<service-id>**. WCCP service ID number for the protocol (51 through 99). The number must be unique among all the WCCP services defined on the router.

- e. To stop the redirection of a protocol’s traffic:

```
wccp protocol remove {tcp | udp | <protocol-number>}
```

6. If you enable external mode, passthrough traffic is included in the reduction tunnels. To enable or disable the tunneling of passthrough traffic (enabled by default):

```
external set pass-through {on | off}
```

7. To commit the changes to the running configuration, exit configuration mode and type **commit**. To retain the changes the next time the device is restarted, type **save-config**.

## Configure Prime-Time Command

The prime time command lets you specify the days of the week and hours of the day when network performance is most important. The prime time can be used to filter performance statistics and to specify bandwidth management policies for prime-time and non prime-time hours. For example, to view reduction and acceleration statistics during business hours, you could set the prime time to 9:00 AM to 5:00 PM on Monday through Friday.

1. Type the current prime-time settings:

```
show -run prime-time
```

2. Type the following command to enter the configure prime-time mode:

```
config prime-time
```

3. To enable or disable prime time:

```
set mode {on | off}
```

Prime time is disabled by default, which means the effective “prime time” is 24-hours a day, seven days a week.

4. To specify the days of the week in prime time:

```
set days {mon,tue,wed,thu,fri,sat,sun}
```

The days must be separated by commas (no spaces).

5. To specify the prime-time hours for the selected days of the week:

```
set hours <hour-hour>
```

Where the time range is in 24-hour format (such as “9-17” for 9 AM to 5 PM).

6. To commit the changes to the running configuration, exit configuration mode and type **commit**. To retain the changes the next time the device is restarted, type **save-config**.

## Configure Profile Mode Command

When a Peribit device is installed in Profile Mode, you can view the performance for specific remote subnets by defining “virtual” Peribit devices and associating one or more subnets with each virtual device. If you also specify a circuit speed, it is used to estimate the maximum possible acceleration of TCP traffic that might be obtained using Packet Flow Acceleration.

On the reduction and acceleration reports, you can select a virtual device from the Destination menu to view the performance for the associated remote subnets (refer to [“Viewing Results” on page 201](#)).

1. To view the current Profile Mode settings:

```
show -run profile-mode
```

2. Type the following command to configure Profile Mode:

```
config profile-mode
```

3. To enable or disable Profile Mode (disabled by default):

```
set mode <on | off>
```

---

**CAUTION:**Enabling Profile Mode disables the Remote interface. If the Peribit device is installed in the data path, all data transmission through the device will stop.

---

4. To add a “virtual” Peribit device and its circuit speed (in Kbps):

```
remote-sr add <IP address> [<speed>]
```

To remove a virtual device:

```
remote-sr remove <IP address>
```

5. To associate a remote subnet with a virtual device:

```
remote-sr subnet add <IP address> <subnet/mask>>
```

To delete a subnet from a virtual device:

```
remote-sr subnet remove <IP address> <subnet/mask>>
```

6. To commit the changes to the running configuration, exit configuration mode and type **commit**. To retain the changes the next time the device is restarted, type **save-config**.

## Configure QoS Inbound Command

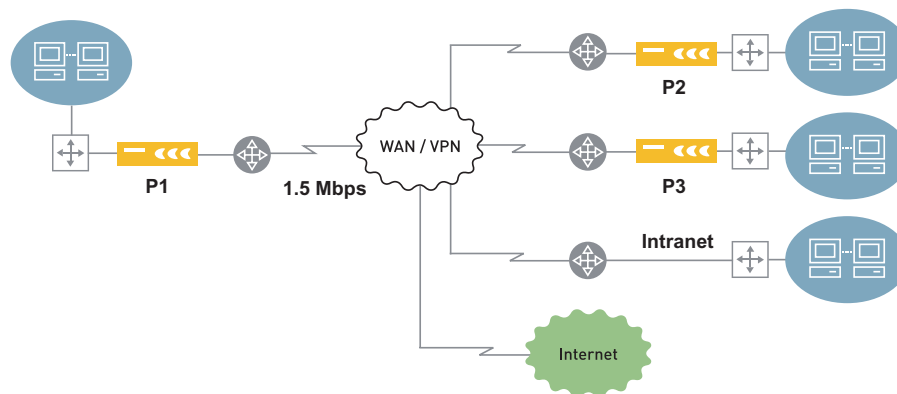
Inbound bandwidth management lets you specify maximum bandwidths for four classes of incoming WAN traffic destined for the Local Area Network (LAN). Setting a maximum bandwidth for each class (and optionally the queue length) ensures that low-priority traffic, such as Web traffic, does not interfere with mission-critical applications. Bandwidths are specified as percentages of the aggregate WAN speed, and traffic that exceeds the maximum bandwidths is dropped.

The following table describes the four traffic classes for inbound bandwidth management.

**Table 11-3 Inbound Bandwidth Management Classes**

| Class    | Description                                                                                                                                                                                                                                                        |
|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Reduced  | Reduced traffic from other Peribit devices.                                                                                                                                                                                                                        |
| Intranet | Unreduced TCP traffic from a specified list of IP subnets (such as the subnets that have no Peribit device). Use the Top Traffic report to help create the list of subnets (refer to <a href="#">“Viewing and Exporting Top Traffic Statistics” on page 222</a> ). |
| TCP      | TCP traffic that is not in the Reduced or Intranet class.                                                                                                                                                                                                          |
| Default  | All traffic that is not in the Reduced, Intranet, or TCP class.                                                                                                                                                                                                    |

In the following example, to enable inbound QoS on Peribit A, you set the aggregate WAN speed to 1500 Kbps (1.5 Mbps), and then set maximum bandwidth percentages for one or more of the four traffic classes. In this example, you might set the maximum bandwidth for the Default class to 10% to limit low-priority traffic from the public Internet.



1. To view the current inbound QoS settings:

```
show -run qos inbound
```

2. Type the following command to enter the configure inbound QoS mode:

```
config qos inbound
```

3. To specify the aggregate WAN speed in Kbps (8 to 1000000) for the WAN edge router associated with the Peribit device:

```
aggregate-wan-speed <8-1000000>
```

4. To configure the bandwidth limits and queue lengths (optional) for each class:

```
class-default max-bw <percentage> [queue-len <1-512>]
```

```
class-intranet max-bw <percentage> [queue-len <1-512>]
```

```
class-reduced max-bw <percentage> [queue-len <1-512>]
```

```
class-tcp max-bw <percentage> [queue-len <1-512>]
```

Where:

**max-bw <percentage>**. Maximum percentage of the aggregate WAN speed allowed for traffic in the specified class. A zero indicates that all traffic in the class will be dropped. A value of 100 (the default) effectively disables inbound bandwidth management for the class.

**queue-len <1-512>**. Maximum number of packets allowed in the queue for this class (the default is 40).

---

**NOTE:** Please contact Technical Support for assistance before changing the queue lengths.

---

5. For the Intranet class, the maximum bandwidth setting applies only to traffic from the subnets you specify. To define a subnet in the Intranet class:

```
define-intranet add <IP Address/Subnet Mask>
```

To remove a subnet from the Intranet class:

```
define-intranet remove <IP Address/Subnet Mask>
```

6. To enable or disable inbound bandwidth management (disabled by default):

```
bw-mgmt <on | off>
```

7. To commit the changes to the running configuration, exit configuration mode and type **commit**. To retain the changes the next time the device is restarted, type **save-config**.

## Configure QoS Outbound Command

Outbound bandwidth is managed by assigning applications to traffic classes, defining templates that specify a priority, guaranteed bandwidth, and maximum bandwidth for each traffic class, and then applying a template to the remote Peribit devices for which you want to manage outbound traffic. You can also specify LAN/WAN address or subnet pairs to be excluded from bandwidth management. For an overview of outbound bandwidth management, refer to [“Understanding Outbound Bandwidth Management” on page 146](#).

When you configure the outbound QoS settings for the first time, you should use the Setup Wizard (refer to [“Using the Outbound QoS Setup Wizard” on page 155](#)). The Setup Wizard creates two templates with the same settings:

- Wizard-PrimeTime
- Wizard-NonPrimeTime

If you use the Web console to customize the settings for specific endpoints, new templates are created whose names include the IP address of the endpoint:

- PTO-<IP\_address> for customized prime-time templates
- NTO-<IP\_address> for customized nonprime-time templates

To change the outbound QoS settings:

1. To view the current outbound QoS settings:

```
show -run qos outbound
```

2. Type the following command to enter the configure inbound QoS mode:

```
config qos outbound
```

To undo your outbound QoS changes by copying the running configuration to the candidate configuration, exit from configuration mode and type:

```
rollback
```

3. To enable or disable outbound bandwidth management, select one of the prioritization methods (disabled by default):

```
set mode <tos-priority | bw-weighted-fair-queueing | bw-strict-priority | off>
```

Where:

- **tos-priority**. Queues are created based on the ToS/DSCP values, and the higher priority queues are processed first. This method cannot be used with acceleration, and may cause low-priority traffic to be dropped (QoS templates are ignored—no guaranteed or maximum bandwidths). The outbound QoS reports do not apply to this method.
- **bw-weighted-fair-queueing**. Queues are created for each traffic class, and processed according to their priority and guaranteed bandwidth.
- **bw-strict-priority**. Queues are created for each priority, and processed according to their priority. For traffic classes that have the same priority, processing is weighted by the guaranteed bandwidth.

## 4. The following table describes the outbound QoS settings.

| Setting             | Commands                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Aggregate WAN speed | <p>To specify the aggregate WAN speed in Kbps (8 to 1000000) for the WAN edge router associated with the Peribit device:</p> <pre>set aggregate-wan-speed &lt;8-1000000&gt;</pre>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Traffic classes     | <p>Initially, all applications belong to the “Default” class. To add the name of a new traffic class (up to 20 characters):</p> <pre>class add &lt;name&gt;</pre> <p>To move an application to a new class (an application can belong to only one class):</p> <pre>class application move &lt;class&gt; &lt;application&gt;</pre> <p>To change the name of a class:</p> <pre>class set name &lt;oldname&gt; &lt;newname&gt;</pre> <p>To delete a class (any applications in the class are moved to the Default class):</p> <pre>class remove &lt;name&gt;</pre>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Templates           | <p>To add a new template (up to 20 characters):</p> <pre>template add &lt;name&gt;</pre> <p>Different templates can be defined for prime-time and nonprime-time hours. To specify a template’s guaranteed bandwidth percentage (0 to 80) for a traffic class (the default is zero):</p> <pre>template set bw-guaranteed &lt;template&gt; &lt;class&gt; &lt;percent&gt;</pre> <p>The total guaranteed bandwidth percentage for all classes cannot exceed 80%. To specify a template’s maximum bandwidth percentage (0 to 100) for a traffic class (the default is 100%):</p> <pre>template set bw-max &lt;template&gt; &lt;class&gt; &lt;percentage&gt;</pre> <p>Traffic is dropped when the maximum bandwidth is exceeded. A zero indicates that all traffic in the class is dropped</p> <p>To specify a template’s priority (0 to 7) for a traffic class, where 7 is the highest priority (the default is zero):</p> <pre>template set priority &lt;template&gt; &lt;class&gt; &lt;priority&gt;</pre> <p>Priority settings are used by the Strict Priority and Weighted Fair Queueing prioritization methods.</p> <p>To delete a template:</p> <pre>template remove &lt;name&gt;</pre> <p>If the deleted template was applied to an endpoint, all priority and guaranteed bandwidth values are set to zero for that endpoint. Maximum bandwidth values are set to 100%.</p> <p>To specify a template’s maximum queue length (1 to 512) for a traffic class (the default is 80 packets) or the maximum number of milliseconds that a packet can be in the queue before it is dropped (the default is “no-limit”):</p> <pre>template set queue-len &lt;template&gt; &lt;class&gt; &lt;packets&gt;</pre> <pre>template set age-out &lt;template&gt; &lt;class&gt; &lt;2-5000   no-limit&gt;</pre> <p><b>NOTE:</b> Please contact Technical Support for assistance before changing queue lengths or age-out times.</p> |



| Setting            | Commands                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Endpoints          | <p>To manage the outbound bandwidth to a remote Peribit device (endpoint), specify the device's IP address and its associated WAN circuit speed in Kbps (8 to 1000000):</p> <pre>tunnel add &lt;IP address&gt; &lt;speed&gt;</pre> <p><b>CAUTION:</b> Be sure to test the WAN circuit speed. The actual WAN speed is typically less than the rated speed (refer to <a href="#">“WAN Circuit Speeds and Router Overhead” on page 148</a>). Exceeding the actual WAN speed effectively shifts bandwidth management to the router, and may cause the router to drop traffic.</p> <p>To change an endpoint's circuit speed (8 to 1000000, in Kbps):</p> <pre>tunnel set &lt;address   other-traffic&gt; &lt;8-1000000&gt;</pre> <p>The predefined “other-traffic” endpoint is used to manage the bandwidth for all traffic that is not sent to one of the specified Peribit devices. The circuit speed for “other-traffic” defaults to the aggregate WAN speed.</p> <p>To assign a template to an endpoint for prime-time or nonprime-time hours:</p> <pre>tunnel set prime-time &lt;address   other-traffic&gt; &lt;template&gt;</pre> <pre>tunnel set non-prime-time &lt;address   other-traffic&gt; &lt;template&gt;</pre> <p>To remove a template from an endpoint, replace the template name with a “—” in the above commands (sets all priority and guaranteed bandwidth values to zero and all maximum bandwidths to 100%).</p> <p>To delete an endpoint from outbound bandwidth management:</p> <pre>tunnel remove &lt;IP address&gt;</pre> <p>Traffic to the deleted endpoint will be managed by the “Other-traffic” endpoint. You cannot delete an endpoint for which acceleration is enabled.</p> |
| Congestion control | <p>On a Sequence Mirror device, if the WAN bandwidth to a remote Sequence Mirror is variable, such as for Frame Relay or shared satellite links, you can enable congestion control for traffic sent to that device. The Sequence Mirror will then dynamically adjust the bandwidth allocation for each endpoint based on the current congestion.</p> <p>To enable or disable congestion control (disabled by default):</p> <pre>set congestion-control-mode &lt;on   off&gt;</pre> <p>To enable congestion control for all QoS-enabled endpoints or a list of included endpoints (default is all endpoints):</p> <pre>set congestion-control-endpoint-policy &lt;all   include&gt;</pre> <p>To enable or disable congestion control for a specific endpoint:</p> <pre>tunnel set congestion-control-mode &lt;IP address&gt; &lt;on   off&gt;</pre> <p>To specify the minimum bandwidth (in Kbps) for an endpoint (optional):</p> <pre>tunnel set min-bandwidth &lt;IP address&gt; &lt;bandwidth&gt;</pre> <p>The minimum WAN speed depends on the network. For Frame Relay, use the CIR; for a shared satellite link, use a percentage of the total speed, depending on how many devices share the link. For MPLS networks, use the service level guarantee.</p> <p><b>NOTE:</b> Enabling congestion control for remote Sequence Reducers has no effect.</p>                                                                                                                                                                                                                                                                                                                                             |

| Setting           | Commands                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Virtual endpoints | <p>To manage the outbound bandwidth for traffic that is not sent to a Peribit device, you can assign one or more destination subnets to virtual endpoints. All other non-Peribit traffic is managed by the settings for the “Other-traffic” endpoint. The maximum number of virtual endpoints (up to 120) depends on the device type (2 for the SR-15, 5 for the SR-20 and SM-250).</p> <p>To add virtual endpoints:</p> <pre>non-sr add name &lt;name&gt; bandwidth &lt;8-1000000&gt; [prime-time &lt;template&gt;] [non-prime-time &lt;template&gt;] [mode &lt;on   off&gt;]</pre> <p>Where:</p> <ul style="list-style-type: none"> <li>• <b>name &lt;name&gt;</b>. Virtual endpoint name (up to 20 characters). If the name includes spaces, enclose the name in quotation marks.</li> <li>• <b>bandwidth &lt;8-1000000&gt;</b>. WAN circuit speed associated with this endpoint (in Kbps).</li> <li>• <b>prime-time &lt;template&gt;</b>. Optional name of the template used for prime-time hours. Default is none (all priority and guaranteed bandwidth values are zero, and all maximum bandwidths are 100%).</li> <li>• <b>non-prime-time &lt;template&gt;</b>. Optional name of the template used for nonprime-time hours. Default is none.</li> <li>• <b>mode &lt;on   off&gt;</b>. Enables or disables the endpoint (enabled by default). If you disable a virtual endpoint, any traffic to its associated subnets is managed by the “Other-traffic” endpoint.</li> </ul> <p>To add destination addresses or subnets to a virtual endpoint (multiple addresses/subnets must be separated by spaces and enclosed in double quotation marks):</p> <pre>non-sr subnets add name &lt;endpoint&gt; subnets &lt;ip-address&gt; [/mask] , &lt;ip-address&gt; [/mask] ...</pre> <p>Note that adding an address/subnet to one endpoint automatically deletes it from any other virtual endpoint. If a subnet is also advertised by a Peribit device, the subnet here is ignored.</p> <p>To change a virtual endpoint, specify the name and the properties you want to change:</p> <pre>non-sr add name &lt;name&gt; [new-name &lt;name&gt;] [bandwidth &lt;8-1000000&gt;] [prime-time &lt;template&gt;] [non-prime-time &lt;template&gt;] [mode &lt;on   off&gt;]</pre> <p>To remove a template from an endpoint, replace the template name with a “-” in the above command (sets all priority and guaranteed bandwidth values to zero and all maximum bandwidths to 100%).</p> <p>To remove addresses or subnets:</p> <pre>non-sr subnets remove &lt;ip-address&gt; [/mask] ...</pre> <p>To delete a virtual endpoint:</p> <pre>non-sr remove &lt;name&gt;</pre> <p>Traffic to the subnets associated with the deleted endpoint will be managed by the settings for the “Other-traffic” endpoint.</p> |

| Setting          | Commands                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ToS/DSCP         | <p>The ToS/DSCP values on incoming LAN traffic can be changed to support other QoS devices in the network. For each traffic class, you can specify a ToS IP precedence value or a DSCP value. The specified ToS/DSCP values apply to all traffic in the class, regardless of whether the traffic is reduced or outbound QoS is enabled.</p> <p>To specify whether ToS or DSCP values are changed (disabled by default):</p> <pre>tos-dscp set mode &lt;tos   dscp   off&gt;</pre> <p>For applications whose traffic is reduced, specify whether the ToS/DSCP value is restored to its original value after the traffic is assembled by the remote Peribit device (enabled by default):</p> <pre>tos-dscp set restore &lt;on   off&gt;</pre> <p>To enable or disable ToS/DSCP changes for a traffic class (disabled by default):</p> <pre>tos-dscp class set mode &lt;class&gt; &lt;on   off&gt;</pre> <p>To set a 6-bit DSCP value (0 to 63) for a traffic class:</p> <pre>tos-dscp class set dscp &lt;class&gt; &lt;0-63&gt;</pre> <p>To set an 8-bit DSCP value (0 to 255) for a traffic class (only the lower six bits are used):</p> <pre>tos-dscp class set dscp-byte &lt;class&gt; &lt;0-255&gt;</pre> <p>To set a ToS IP precedence value (0 to 7) for a traffic class:</p> <pre>tos-dscp class set ip-precedence &lt;class&gt; &lt;0-7&gt;</pre> |
| Excluded subnets | <p>To avoid managing traffic addressed to the router on the WAN side of the Peribit device, all LAN traffic sent to the Peribit device's subnet is excluded from outbound bandwidth management. This ensures that we manage only the traffic sent across the WAN.</p> <p>To view the current filter settings:</p> <pre>show -run qos excl-filter</pre> <p>To access the configuration mode for the exclusion filter:</p> <pre>configure qos excl-filter</pre> <p>To enable or disable the exclusion filter (enabled by default):</p> <pre>set mode &lt;on   off&gt;</pre> <p>To exclude additional LAN/WAN address or subnet pairs from outbound bandwidth management:</p> <pre>add &lt;LAN address&gt;[/mask] -&lt;WAN address&gt;[/mask]</pre> <p>Use an asterisk (*) by itself to indicate any LAN/WAN address or subnet.</p> <p><b>NOTE:</b> Traffic bursts between excluded addresses are unrestrained by priority or bandwidth considerations, and may cause other traffic to be dropped by the router.</p> <p>To delete one or all excluded LAN/WAN address or subnet pairs:</p> <pre>remove {&lt;LAN address&gt;[/mask] -&lt;WAN address&gt;[/mask]   all}</pre> <p>Use an asterisk (*) by itself to indicate any LAN or WAN address or subnet.</p>                                                                                              |

5. To commit the changes to the running configuration, exit configuration mode and type **commit**. To retain the changes the next time the device is restarted, type **save-config**.

## Configure RADIUS Command

The RADIUS command is used to define RADIUS servers and server groups. At least one server group is required. To specify how the server groups are used to authenticate users, refer to [“Configure AAA Command” on page 260](#).

1. To view the current RADIUS settings:

```
show -run radius
```

2. Type the following command to enter the configure RADIUS mode:

```
config radius
```

3. You can define up to 20 RADIUS servers. To add a RADIUS server:

```
server add name <name> ip-address <address> auth-port <number>
timeout <seconds> retransmit <number> dead-time <minutes>
```

Where:

- **name <name>**. RADIUS server name (up to 32 characters). If the name includes spaces, enclose the name in quotation marks.
- **ip-address <address>**. IP address of the server.
- **auth-port <number>**. Authentication UDP port number on the server (default is 1812).
- **timeout <seconds>**. Number of seconds (1 to 65535) that the Peribit device waits for the server to respond (default is three).
- **retransmit <number>**. Number of times (1 to 100) that a request is sent to the server (default is three).
- **dead-time <minutes>**. Number of minutes (0 to 1440) after all retransmissions fail that the Peribit device waits before trying to access the server again (default is zero).

and then press **Enter**. Type the secret key (up to 31 characters) used to access the server and press **Enter**, and then repeat to verify. The same key must be configured on the RADIUS server.

To change the key used to access the server:

```
server set name <name> key
```

and then press **Enter**. Type the new key and press **Enter**, and then repeat to verify. Make the same change on the RADIUS server.

To change other server properties, specify the server name and the settings you want to change:

```
server set name <name> new-name <name> ip-address <address> auth-port
<number> timeout <seconds> retransmit <number> dead-time <minutes>
```

To remove a server definition:

```
server remove <name>
```

4. You can define up to four server groups, with up to five servers per group (each server can belong to multiple groups). To add a server group name (up to 32 characters):

```
server-group add name <name>
```

The servers in a group are accessed in the order specified. For example, if the first server does not respond, the second server is accessed. To add a RADIUS server to a server group:

```
server-group server add <group-name> <server-name>
```

To change the name of a server group:

```
server-group set name <name> new-name <name>
```

To delete a server group (does not delete the associated servers):

```
server-group remove <name>
```

5. To change the source IP address used in RADIUS packets (defaults to the device's IP address):

```
set client-source <IP address>
```

6. To commit the changes to the running configuration, exit configuration mode and type **commit**. To retain the changes the next time the device is restarted, type **save-config**.

## Configure Reduction Command

The Reduction command enables you to configure the reduction and assembly engines.

1. To view the current reduction settings:

```
show -run reduction [all | network-sequence-mirroring | pre-sync status]
```

2. Type the following command to enter the configure reduction mode:

```
config reduction
```

3. To specify the community topology (the default is mesh):

```
set topology-type <hub | mesh | spoke>
```

In a Mesh topology, each device in the community can reduce and assemble data for all other devices. In a Hub and Spoke topology, the hub devices can reduce and assemble data for all other devices. By default, the spoke devices reduce data only for the hubs. Mixing Mesh and Hub and Spoke topologies in the same community is not recommended.

To set the range of devices for a Hub or Mesh topology:

```
set topology-size <range number | max-mem>
```

Where:

- **range number.** Indicates a range of devices in the community (0 to 5). An accurate range helps to allocate memory efficiently. Table 11-4 shows the device ranges by device type and topology. The default range number is zero.

**Table 11-4 Device Ranges by Model and Topology**

| Device Type            | Mesh                                                                                                                                                                | Hub         |
|------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|
| SM-500                 | 0=1-15                                                                                                                                                              | 0=1-15      |
|                        | 1=16-20                                                                                                                                                             | 1=16-20     |
|                        | 2=21-25                                                                                                                                                             | 2=21-25     |
|                        | 3=26-30                                                                                                                                                             | 3=26-30     |
|                        | 4=31-35                                                                                                                                                             | 4=31-40     |
|                        | 5=36-40                                                                                                                                                             | 5=41-60     |
|                        | max-mem=1-5                                                                                                                                                         | max-mem=1-5 |
| SM-250                 | 0=1-5                                                                                                                                                               | 0=1-5       |
|                        | 1=6-10                                                                                                                                                              | 1=6-10      |
|                        | 2=11-15                                                                                                                                                             | 2=11-15     |
| SR-15, SR-20           | 0=1-5                                                                                                                                                               | 0=1-5       |
| SR-50                  | 0=1-20                                                                                                                                                              | 0=1-20      |
| SR-55                  | 1=21-35                                                                                                                                                             | 1=21-40     |
|                        | 2=36-50                                                                                                                                                             | 2=41-60     |
|                        | 3=51-60                                                                                                                                                             | 3=61-80     |
|                        | 4=61-70                                                                                                                                                             | 4=81-100    |
|                        | 5=71-80                                                                                                                                                             | 5=101-120   |
| SR-80                  | 0=1-60                                                                                                                                                              | 0=1-60      |
| SR-100                 | 1=61-100                                                                                                                                                            | 1=61-110    |
|                        | 2=101-140                                                                                                                                                           | 2=111-160   |
|                        | 3=141-170                                                                                                                                                           | 3=161-210   |
|                        | 4=171-195                                                                                                                                                           | 4=211-260   |
|                        | 5=196-220                                                                                                                                                           | 5=261-320   |
| SR-100<br>with clients | The total range is the sum of the ranges for each device. If you enter range 4 for an SR-100 hub that has two SR-50 clients, the top value is 460 (260 + 100 +100). |             |

- **max-mem.** Allocates all available memory for five tunnels (20 tunnels for the SR-80 and SR-100). All devices must be the same type and have the same topology setting.

**NOTE:** On devices other than the SM-500, when the maximum range of devices is selected for a hub (range 5), the hub conserves memory by not assembling data from the spokes—only data sent from the hub to the spokes is reduced. In this case, tunnel switching cannot be enabled on the hub (refer to [“Configuring Tunnel Switching in Hierarchical Deployments” on page 141](#)).

4. The following table describes the reduction settings.

| Setting                | Commands                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Reduction and Assembly | <p>You can disable the assembly engine to stop other devices in the community from sending reduced data to this device: To enable or disable the assembly engine (enabled by default):</p> <pre>set assembler &lt;on   off&gt;</pre> <p>To enable or disable data reduction (enabled by default):</p> <pre>set reducer &lt;on   off&gt;</pre> <p>To remove devices from the current list of assemblers:</p> <pre>remove assembler-list &lt;IP addresses&gt;</pre>                                                                                                                                                                                            |
| Endpoints              | <p>By default, each Peribit device attempts to form reduction tunnels with all other devices in the Peribit community. To form tunnels with only specific devices:</p> <pre>add assembler-list &lt;IP addresses&gt;</pre> <p>Multiple IP addresses must be separated by spaces. To replace the current list of assemblers with a new list:</p> <pre>set assembler-list &lt;IP addresses&gt;</pre> <p>To specify which devices to form tunnels with (the default is all):</p> <pre>set assembler-mode &lt;all   list   hub-only&gt;</pre> <p>To remove devices from the current list of assemblers:</p> <pre>remove assembler-list &lt;IP addresses&gt;</pre> |

| Setting                          | Commands                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Network<br>Sequence<br>Mirroring | <p>On a Sequence Mirror device, you can enable or disable the use of Network Sequence Mirroring (NSM) for data reduction. NSM uses disk storage to identify longer patterns of repeated traffic, and retains those patterns for longer periods of time (even when a reduction tunnel is down). NSM is most effective where large files are often sent over the WAN, such as for database backups.</p> <p>To use NSM between two Sequence Mirror devices, standard reduction must be enabled, and you must enable Active Flow Pipelining (AFP) for the appropriate devices and applications. AFP also requires outbound QoS (refer to “<a href="#">Configure Acceleration Command</a>” on page 262).</p> <p>To enable NSM on a Sequence Mirror device (disabled by default):</p> <pre>network-sequence-mirroring set mode &lt;on   off&gt;</pre> <p>To specify how heavily the disk is used for reduction:</p> <pre>network-sequence-mirroring set disk-access-policy &lt;0-3&gt;</pre> <p>The number (0 to 3) indicates how heavily the disk (and CPU) is used during data reduction. Lower values indicate a higher level of disk access (default is 1). For high-bandwidth links, you may want to increase the value to maximize throughput.</p> <p>Under heavy traffic loads, NSM processing for some types of data may reduce overall throughput. In this case, you can enable NSM overflow mode to allow MSR to take over some processing from NSM (disabled by default). Please contact Peribit Support before using this option.</p> <pre>network-sequence-mirroring set overflow-mode &lt;on   off&gt;</pre> <p><b>NSM Endpoints</b></p> <p>To enable NSM for all Sequence Mirror devices in the community or a specific list of devices (default is all):</p> <pre>network-sequence-mirroring endpoint set mode &lt;all   list&gt;</pre> <p>To add devices to the list that are enabled for NSM (include a space between IP addresses):</p> <pre>network-sequence-mirroring endpoint add &lt;IP addresses&gt;</pre> <p>To remove devices from the NSM-enabled list (include a space between IP addresses):</p> <pre>network-sequence-mirroring endpoint remove &lt;IP addresses&gt;</pre> <p><b>NSM Applications</b></p> <p>To define a list of applications that are included or excluded from NSM (default is excluded):</p> <pre>network-sequence-mirroring application mode &lt;include   exclude&gt;</pre> <p>To add an application to the list that is included or excluded from NSM:</p> <pre>network-sequence-mirroring application add &lt;name&gt;</pre> <p>To remove an application from the list:</p> <pre>network-sequence-mirroring application remove &lt;name&gt;</pre> |



| Setting              | Commands                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Pre-Synchronization  | <p>Large files, such as database files and software updates, can be preloaded on remote NSM-enabled devices. The repeated patterns in the files are added to the reduction dictionaries, so that when a user requests the files, the response time is much faster. The files must be on an FTP server. Be sure to enable NSM for the application that users will access to retrieve the preloaded files. To pre-synchronize a file for a remote NSM-enabled device:</p> <pre>network-sequence-mirroring pre-sync &lt;NSM-device-address&gt; ftp://&lt;host:port&gt;[:&lt;username&gt;:&lt;password&gt;]/&lt;path and file name&gt;</pre> <p>The <i>host</i> is the FTP server name or IP address. If the FTP server allows anonymous access, and the default port (port 21) is used, enter:</p> <pre>network-sequence-mirroring pre-sync &lt;NSM-device-address&gt; ftp://&lt;host&gt;/&lt;path and file name&gt;</pre> |
| Default assemblers   | <p>To create a list of up to six default assemblers (for more information about default assemblers, refer to <a href="#">“Defining Default Assemblers” on page 135</a>):</p> <pre>set def-assembler-list &lt;IP address&gt;</pre> <p>Multiple IP addresses must be separated by a space.</p> <p>To add subnets to be excluded from the default assemblers:</p> <pre>add excl-subnet-list &lt;IP address&gt;/&lt;subnet mask&gt;</pre> <p>To remove all or specific subnets from the exclude list:</p> <pre>remove excl-subnet-list &lt;all   IP address&gt;/&lt;subnet mask&gt;</pre>                                                                                                                                                                                                                                                                                                                                   |
| Preferred assemblers | <p>When two or more Peribit devices in a community can reach a single subnet, and no other policies apply, traffic is routed to each device on an arbitrary basis. To use a specific device when there is more than one path, you can specify that device as a preferred assembler. To designate one or more (up to 80) preferred assemblers:</p> <pre>set pref-assembler-list &lt;space separated list of SR IP addresses&gt;</pre>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Load balancing       | <p>The load balancing policy enables two or more Peribit devices to share the transmission of reduced data to a common destination with equal cost paths. To enable or disable load balancing:</p> <pre>set lb-policy &lt;off   per-packet   per-destination   per-flow&gt;</pre> <p>Where:</p> <ul style="list-style-type: none"> <li>• <b>off.</b> All traffic is routed to one of the available tunnels. No load balancing (default).</li> <li>• <b>per-packet.</b> Traffic is distributed on a per-packet basis (round robin).</li> <li>• <b>per-destination.</b> Traffic is distributed based on destination IP address.</li> <li>• <b>per-flow.</b> Traffic is distributed based on source and destination IP addresses and ports.</li> </ul>                                                                                                                                                                     |

| Setting           | Commands                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Tunnel mode       | <p>To change how traffic is sent through a reduction tunnel:</p> <pre>set tunnelmode &lt;standard   multi-flow   visibility   ipcomp&gt;</pre> <p>Where:</p> <ul style="list-style-type: none"> <li>• <b>standard.</b> Sends reduced data as a single flow between the source and destination Peribit devices (port 3577). Enabled by default.</li> <li>• <b>multi-flow.</b> Arbitrarily assigns source port numbers to each traffic flow so that routers using Weighted Fair Queueing (WFQ) to distribute WAN bandwidth can correctly identify the various application flows.</li> <li>• <b>visibility.</b> Preserves the source and destination ports of all packets so that performance monitoring tools can identify the various devices responsible for the traffic in the reduction tunnel. Tunneled traffic is enclosed in UDP “meta” packets, so verify that your tools are configured to monitor UDP traffic.</li> <li>• <b>ipcomp.</b> Reduces the size of each meta-packet header by six bytes. May improve reduction in environments that have many small packets with relatively low compression ratios. Changes the meta-packet from UDP to a proprietary version of the IP payload compression protocol (protocol number 108).</li> </ul> <p>If the tunnel mode is multi-flow, the default maximum number of flows is 256 (used to allocate resources—not a hard limit). To change the default:</p> <pre>set max-flows &lt;integer between 256 and 1024&gt;</pre> |
| Tunnel switching  | <p>To enable tunnel switching on selected devices, such as to send reduced traffic between communities (disabled by default):</p> <pre>set tunnel-switching {on   off}</pre> <p><b>NOTE:</b> This feature must be implemented carefully to avoid unnecessary compression. For more information, refer to <a href="#">“Configuring Tunnel Switching in Hierarchical Deployments” on page 141</a>. Tunnel switching cannot be used on hubs where the topology setting specifies the maximum range of devices.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Heartbeat packets | <p>By default, UDP keep-alive packets or “heartbeats” are sent every 5 seconds to confirm the operability of the other Peribit devices in the community. To change the heartbeat frequency:</p> <pre>set heartbeat-frequency &lt;1-300&gt;</pre> <p><b>NOTE:</b> All Peribit devices in the same community must have the same heartbeat frequency.</p> <p>If a device fails to respond to four consecutive heartbeats, the other Peribit devices stop reducing data for the device (passthrough mode). If 10 consecutive heartbeat get no response, the other devices disable their reduction tunnels with the device, and attempt to reestablish the tunnel every three minutes.</p> <p>To change the number of missed heartbeats that stops data reduction and disconnects the tunnels:</p> <pre>set heartbeat-misses passthru &lt;number   default&gt; disconnect &lt;number   default&gt;</pre> <p>The number of missed heartbeats allowed is higher for remote endpoints for which Active Flow Pipelining or Forward Error Correction is enabled (refer to <a href="#">“Configure Acceleration Command” on page 262</a>).</p>                                                                                                                                                                                                                                                                                                                                               |
| LAN/WAN check     | <p>The LAN-WAN check is an important safety feature that helps prevent routing configuration errors. However, if the default gateway is on the LAN side of the Peribit device, or if you want to allow reduction tunnels on the LAN side of the device (such as for tunnel switching), you must disable the LAN-WAN check.</p> <pre>set lan-wan-check &lt;on   off&gt;</pre>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

| Setting                           | Commands                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|-----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Meta-packets                      | <p>Multiple packets of reduced data are encapsulated in “meta” packets of up to 1500 bytes. If a device on the WAN side of the Peribit device adds to the packet (such as a VPN device), you can reduce the maximum meta packet size to avoid packet fragmentation by the router. Before you adjust the maximum meta packet size, verify the approximate number of bytes that are added by the network device.</p> <p>To set the maximum meta packet size:</p> <pre>set max-meta-pkt-size &lt;number between 576 and 1500&gt;</pre> <p>By default, the amount of time each meta-packet of reduced data is held is based on the round-trip time (RTT) to the destination device. To change the meta-packet wait time:</p> <pre>set meta-packet-wait &lt;mode&gt;</pre> <p>Where &lt;mode&gt; is “default”, “absolute-time”, or “rtt”.</p> <p>If you enter “absolute-time” as the mode, enter an amount of time (in 2 ms increments) for the meta-packet to wait before transmitting across the network. By default, this setting is 8 ms. For example,</p> <pre>set meta-packet-wait absolute-time 4</pre> <p>If you enter “rtt” as the mode, enter a percentage number that will be calculated by the RTT and used to hold the meta-packet before being transmitted across the network. For example,</p> <pre>set meta-packet-wait rtt percent-rtt 15</pre> <p>In addition to the RTT percentage, you can set an upper limit for which a packet will be held (in 2 ms. increments). The default is 8 ms. For example,</p> <pre>set meta-packet-wait rtt percent-rtt 15 limit 20</pre> <p>In extreme latency-sensitive networks, you can disable the grouping of reduced packets into meta packets so that reduced data is sent on a per-packet basis.</p> <pre>set multi-packet off</pre> |
| Dynamic Resource Allocation (DRA) | <p>DRA enhances reduction performance on low-speed WAN links (such as 128 Kbps). During good network conditions (such as low CPU load), the Peribit device attempts to further reduce the data without compromising latency or packet loss. To enable or disable DRA (enabled by default):</p> <pre>set modes DRA &lt;on   off&gt;</pre> <p><b>NOTE:</b> It is strongly recommended that you enable outbound QoS and specify the WAN circuit speed for each remote Peribit device. For more information, refer to <a href="#">“Configure QoS Outbound Command” on page 287</a>.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| MSR symbol size                   | <p>By default, the Molecular Sequence Reduction (MSR) algorithm looks for repeated traffic patterns in units of four bytes (the symbol size). In general, larger symbol sizes require less processing, but achieve lower data reduction rates. To change the symbol size:</p> <pre>set modes msr &lt;number&gt;</pre> <p>The valid symbol sizes are: 1-8, 10, 12, 16, 32, and 64. On an SR-15, do not exceed a symbol size of 8.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

| Setting                 | Commands                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                      |                  |   |   |   |    |   |    |   |    |   |     |   |     |   |     |   |     |
|-------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|------------------|---|---|---|----|---|----|---|----|---|-----|---|-----|---|-----|---|-----|
| Peribit ToS/DSCP values | <p>Peribit devices use small TCP packets to send data to each other, such as for routing and dictionary updates. These packets have normal priority (zero) and may be dropped in heavily congested networks. To change the ToS/DSCP value (0 to 255) for Peribit packets:</p> <pre>set tos-bit &lt;0-255&gt;</pre> <p>To set a ToS IP precedence value (0 to 7), enter a CLI value that sets the upper three bits (bits 6, 7, and 8) of the ToS/DSCP byte:</p> <table> <tr> <th><u>IP Precedence</u></th><th><u>CLI value</u></th></tr> <tr><td>0</td><td>0</td></tr> <tr><td>1</td><td>32</td></tr> <tr><td>2</td><td>64</td></tr> <tr><td>3</td><td>96</td></tr> <tr><td>4</td><td>128</td></tr> <tr><td>5</td><td>160</td></tr> <tr><td>6</td><td>192</td></tr> <tr><td>7</td><td>224</td></tr> </table> <p>To set a ToS type-of-service value (0 to 15), enter a CLI value that sets bits 2 through 5. For example, a CLI value of 2 equals a type-of-service value of 1.</p> <p>To set a DSCP value (0 to 63), enter a CLI value that sets the upper six bits of the ToS/DSCP byte. For example, a CLI value of 4 equals a DSCP value of 1.</p> <p><b>NOTE:</b> These values are overridden by the IP precedence or DSCP settings defined for Multi-Path (refer to <a href="#">“Configuring Policy-Based Multi-Path” on page 113</a>).</p> | <u>IP Precedence</u> | <u>CLI value</u> | 0 | 0 | 1 | 32 | 2 | 64 | 3 | 96 | 4 | 128 | 5 | 160 | 6 | 192 | 7 | 224 |
| <u>IP Precedence</u>    | <u>CLI value</u>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                      |                  |   |   |   |    |   |    |   |    |   |     |   |     |   |     |   |     |
| 0                       | 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                      |                  |   |   |   |    |   |    |   |    |   |     |   |     |   |     |   |     |
| 1                       | 32                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                      |                  |   |   |   |    |   |    |   |    |   |     |   |     |   |     |   |     |
| 2                       | 64                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                      |                  |   |   |   |    |   |    |   |    |   |     |   |     |   |     |   |     |
| 3                       | 96                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                      |                  |   |   |   |    |   |    |   |    |   |     |   |     |   |     |   |     |
| 4                       | 128                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                      |                  |   |   |   |    |   |    |   |    |   |     |   |     |   |     |   |     |
| 5                       | 160                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                      |                  |   |   |   |    |   |    |   |    |   |     |   |     |   |     |   |     |
| 6                       | 192                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                      |                  |   |   |   |    |   |    |   |    |   |     |   |     |   |     |   |     |
| 7                       | 224                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                      |                  |   |   |   |    |   |    |   |    |   |     |   |     |   |     |   |     |
| Policy routes           | <p>Policy routes let you vary the default gateway used for reduced traffic based on the application. To add a policy route:</p> <pre>policy-route add &lt;application name&gt; &lt;gateway_IP_address&gt;</pre> <p>To remove a policy route:</p> <pre>policy-route remove &lt;application name&gt;</pre>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                      |                  |   |   |   |    |   |    |   |    |   |     |   |     |   |     |   |     |

5. To commit the changes to the running configuration, exit configuration mode and type **commit**. To retain the changes the next time the device is restarted, type **save-config**.

## Configure Reduction Subnets Command

Reduction subnets are the subnets on the LAN side of the Peribit device that you can selectively advertise to the other Peribit devices in the community. The other devices can then reduce and accelerate traffic sent to the advertised subnets. Initially, the only reduction subnet is the subnet where the Peribit device is installed. To identify more LAN-side subnets, you can:

- Add static routes manually (refer to [“Configure Route Command” on page 306](#))
- Add dynamic routes using one of the following methods:
  - Enable the Open Shortest Path First (OSPF) and/or the Routing Information Protocol (RIPv1, RIPv2), as described in [“Configure OSPF Command” on page 281](#) and [“Configure RIP Command” on page 305](#)
  - Periodically poll the routing table of a Cisco router (refer to [“Configure Route Poll Command” on page 308](#))
  - Import a file of routes from an FTP server (refer to [“Import Route Table Command” on page 251](#))
- Enable the WAN reduction subnet option to include routes discovered on the Remote interface. In some environments, local routes may be discovered on the WAN side of the Peribit device.

The set of subnets advertised by each device is called a “netmap.” By default, only the subnets you specify are advertised. You can enable the advertisement of all subnets or just selected subnets. To advertise specific subnets, you can create an Enabled list and a Disabled list of local IP subnets, and then set the mode for the lists to All, Include, or Exclude.

For example, if you have five subnets in the Enabled list and one subnet in the Disabled list, and the mode is set to “Include,” only the subnets in the Enabled list are advertised. If the mode is set to “Exclude,” only the subnet in the Exclude list is advertised. If the mode is set to “All,” all subnets are advertised and the lists are ignored.

1. To view the current reduction subnets and subnet settings:

```
show -run reduction-subnet

Mode: include
Wan-reduction-subnet Mode: off

Destination      Netmask      Cost   Enabled   Interface
192.168.0.0      255.255.255.0  1      no        Local
```

The **Enabled** column indicates whether the subnet is advertised.

2. Type the following command to enter the configure reduction subnet mode:

```
config reduction-subnet
```

3. To add entries to the Enabled list of reduction subnets:

```
add enable <IP address/subnet mask>
```

To add entries to the Disabled list of reduction subnets:

```
add disable <IP address/subnet mask>
```

If a subnet is on both the Enabled and Disabled lists, the subnet is disabled.

To remove entries from the Enabled or Disabled lists:

```
remove enable <IP address/subnet mask>
remove disable <IP address/subnet mask>
```

To set the reduction mode (the default is “include”, which advertises subnets on the Enabled list):

```
set mode <all | include | exclude>
```

4. By default, only routes discovered on the LAN side of the Peribit device (the Local interface) can be advertised as reduction subnets. For example, in VLAN environments, some LAN-side routes can be discovered only on the WAN side.

When the Peribit device issues an ARP for a destination, only the router can respond with the appropriate VLAN tag. Since the router is on the WAN side, the local subnets appear to be WAN-side subnets and, by default, are excluded from the Reduction Subnets page and cannot be advertised for reduction.

To include routes discovered on the Remote interface as potential reduction subnets:

```
set wan-reduction-subnet on
```

This option is enabled by default if the Peribit device is installed off-path (refer to [“Configure Packet Interception Command” on page 282](#)).

---

**NOTE:** Allow up to one minute for the remote routes to be added to the list of reduction subnets. After the routes are added, be careful to advertise only the LAN-side routes.

---

5. Each Peribit device dynamically adjusts its advertised subnets to exclude (carve out) any hosts or gateways that become unreachable. To enable or disable this feature (enabled by default):

```
set carveout <on | off>
```

6. To verify the mode and reduction subnets before committing these changes:

```
show reduction-subnet
```

7. To apply the changes to the running configuration, exit configuration mode and type **commit**. To retain the changes the next time the device is restarted, type **save-config**.

---

**NOTE:** If you disable an advertised subnet, you must reboot the device for the change to take effect.

---

## Configure Registration Server Command

When you install a Peribit device, you must designate one device as the registration server. The registration server stores network information for all devices that report to it, and identifies a Peribit community for each device. Every Peribit device periodically contacts the registration server to obtain information about other devices in the community. Initially, all Peribit devices are in the Default community.

Data reduction can occur only between Peribit devices in the same community. You can define separate communities to control how data is reduced, and you can add the same device to multiple communities for backup and redundancy. A device that belongs to multiple communities can reduce and assemble data for the devices in all of its communities.

If you are logged in to the registration server, you can change the password of the registration server, or designate a different Peribit device as the registration server. You can also add and change communities, and assign a secondary registration server to act as a backup when the primary registration server is not available.

1. To view the current registration server settings:

```
show -run reg-server
```

2. Type the following command to enter the configure registration server mode:

```
config reg-server
```

3. To set the IP address of the registration server:

```
set ip-address <registration server IP address>
```

To designate this device as a registration server, enter the IP address of this device. If this device is not the registration server, enter the IP address of the current (or future) registration server, and enter the registration server password.

If you have not yet configured the registration server for the Peribit community, enter the future IP address of the registration server and enter the default password, “peribit”.

4. To specify a secondary registration server to act as a backup when the primary registration server is not available:

```
set sec-ip-address <secondary registration server IP address>
```

To specify the number of times the Peribit device attempts to access the primary registration server before switching to the secondary (the default is 1):

```
set connect-retries <1-5>
```

To specify the number of seconds between retries (the default is 2):

```
set connect-timeout <2-60>
```

5. To set the registration server password, enter the following command, and then enter and confirm the password at the prompts (also applies to the secondary server):

```
set password
```

---

**NOTE:** Changing the password disrupts communication with all Peribit devices that use the registration server. To restore communication with the registration server, you must update the registration server password on each Peribit device.

---

6. To specify the name of a new Peribit community (up to 31 characters):

```
community add <name>
```

To change a community name:

```
community set name <old name> <new name>
```

To add a Peribit device to a community:

```
community remote-sr add <community> <IP address>
```

To delete a Peribit device from a community:

```
community remote-sr remove <community> <IP address>
```

To delete a community:

```
community remove <name>
```

When a community is deleted, or when devices are removed from a community, the devices are moved to the Default community if they do not belong to any other user-defined communities.

7. If you add or change communities on a secondary registration server, you can export the community database to the primary server:

```
community export-to-primary
```

To prevent the primary registration server from overriding the community database on the secondary server:

```
community set disable-import
```

8. To commit the changes to the running configuration, exit configuration mode and type **commit**. To retain the changes the next time the device is restarted, type **save-config**.

## Configure Remote Routes Command

Remote routes are the reduction subnets advertised by other Peribit devices in the community. You can specify how often remote routes are fetched from the other Peribit devices, and whether each remote route is validated.

1. To view the current remote routes and settings:

```
show -run remote-routes
```

---

**NOTE:** Each Peribit device dynamically adjusts its advertised subnets to exclude unreachable addresses. In this case, multiple remote routes must be advertised for the same subnet to exclude unresponsive addresses.

---

2. Type the following command to enter the configure remote route mode:

```
config remote-routes
```

3. To validate the remote routes advertised by other Peribit devices, you can enable route validation. Each time remote routes are advertised or fetched, three probe packets are sent to three representative IP addresses in each advertised subnet. If the remote Peribit device receives any of the probes, it discards the probes without forwarding them, and returns a report to the sending device (over TCP). If a report is not received in one minute, the route is dropped from the remote routes.

To enable or disable remote route validation (disabled by default):

```
set validation <on | off>
```

---

**NOTE:** Enable route validation only if the validity of the remote routes is in question. You should not use this option if load balancing is enabled.

---

4. To specify how often remote routes are fetched from the other Peribit devices in the community (the default is every 3600 seconds):

```
set frequency <once | 3600 | 7200 | 10800 | 86400>
```

Remote routes are advertised each time a device starts, and route changes are advertised as soon as they occur. Fetching routes periodically helps ensure the consistency of routing information across all the Peribit devices in the community.

5. To commit the changes to the running configuration, exit configuration mode and type **commit**. To retain the changes the next time the device is restarted, type **save-config**.



## Configure RIP Command

If your network uses RIP, you can configure the Peribit device to use RIP to dynamically discover routes on both the Local and Remote interfaces. In this case, the Peribit device only receives routes, it does not send them. Off-path Peribit devices can be configured to both send and receive RIP routes (refer to [“Configure Packet Interception Command” on page 282](#)).

1. To view the current RIP configuration:

```
show -run rip
```

2. Type the following command to enter the configure RIP mode:

```
config rip
```

3. To specify the number of seconds before a route is aged out (the default is 300):

```
set ageout <1 - 8400>
```

4. To specify whether a RIP password is used in your network (default is none):

```
set auth-type <password | none>
```

To specify the RIP password (up to 15 characters):

```
set password <password>
```

5. To specify whether RIP version 1 or 2 is used (the default is 2):

```
set version <1 | 2>
```

6. To enable or disable RIP (disabled by default):

```
set rip <on | off>
```

7. To commit the changes to the running configuration, exit configuration mode and type **commit**. To retain the changes the next time the device is restarted, type **save-config**.

## Configure Route Command

When you first install a Peribit device, its routing table contains the local subnet where the device is installed, a route to the default gateway (the default route), and the loopback address. Use the Route command to add static routes to the routing table, enable router load balancing, and specify the ICMP age-out interval. A total of 8192 IP routes (static and dynamic) are supported (the SR-15 is limited to 1000).

1. To view the current routes and route settings (all routes are shown by default):

```
show -run route [protocol <ospf | rip | static>] [subnet <subnet/mask>]
```

2. Type the following command to enter the configure route mode:

```
config route
```

3. To add a new static route:

```
add <IP address> mask <subnet mask> gateway <gateway IP address> cost <cost>
```

Use dotted-decimal notation for the IP address, mask, and gateway. The **<cost>** is an optional value from 0 to 65535. The default is 1000.

To delete a static route:

```
delete <IP address> mask <mask>
```

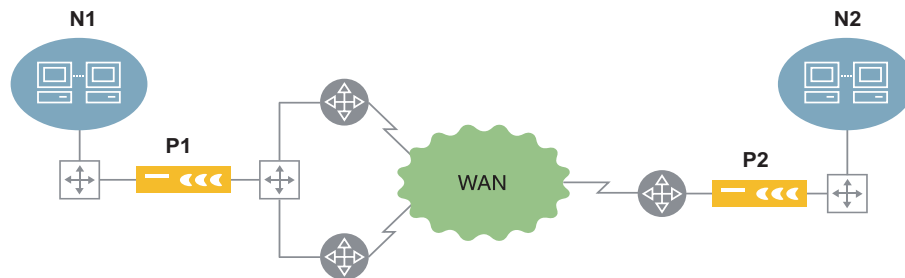
4. To set the precedence between static and dynamic routes (dynamic routes take precedence by default):

```
set precedence <static | dynamic>
```

5. To specify the number of minutes that routes redirected by ICMP are retained before being aged out (the default is 10):

```
set icmp-redirect-ageout <number>
```

6. **Route-based load balancing.** You can configure the Peribit device to distribute traffic for equal-cost paths across up to four different gateways. In Figure 11-2, P1 identifies two gateways that have equal cost paths to the network (N2) advertised by P2. P1 can use the two gateways on a per-destination, per-packet (round-robin), or per-flow basis.



**Figure 11-2 Load Balancing**

To specify the route-based load balancing policy:

```
set lb-policy <off | per-packet | per-destination | per-flow>
```

Where:

- **off.** All traffic is routed to one of the available routers. No load balancing (default).
- **per-packet.** Traffic is distributed on a per-packet basis (round robin).

---

**NOTE:** Packets that lack port information, such as ICMP and fragmented packets, are sent to the first gateway, and are not balanced according to the per-packet scheme.

---

- **per-destination.** Traffic is distributed based on destination IP address.
- **per-flow.** Traffic is distributed based on source and destination IP addresses and ports.

7. **ToS marking for router-based load balancing.** You can configure the local router(s) to distribute reduced traffic based on the ToS type-of-service values set by the Peribit device. The type-of-service values (0 to 15) are set in bits 2 through 5 of the ToS/DSCP field. This method can be used together with route-based load balancing.

---

**NOTE:** You cannot use ToS marking for router-based balancing if DSCP values are set by Multi-Path or outbound QoS. However, the ToS IP precedence values set by these features do not interfere with the type-of-service values defined here.

---

To configure ToS marking for router-based balancing:

- a. Enable ToS marking for load balancing (disabled by default):

```
rtr-based-lb set mode <off | type-of-service>
```

- b. Specify two or more (up to 16) type-of-service values (0 to 15), separated by spaces:

```
rtr-based-lb set tos <0 - 15>
```

- c. Specify the load balancing policy (default is per destination):

```
rtr-based-lb set lb-policy <per-packet | per-destination | per-flow>
```

Where:

- **per-packet.** ToS values are assigned to each reduced meta-packet in round robin fashion.
- **per-destination.** ToS values are assigned to each reduced meta-packet by applying a hash function to the destination IP address.
- **per-flow.** ToS values are assigned to each reduced meta-packet by applying a hash function to the source and destination IP addresses and ports.
- Note that per-flow and per-destination router balancing will lower the percentage of data reduction because each meta-packet contains traffic for only one flow or destination.

- d. Configure the router(s) to distribute the meta-packets based on the type-of-service values. On the inbound interface from the Peribit device, define a route map for router-balancing:

```
interface FastEthernet1/0
ip address 10.129.30.5 255.255.255.0
ip policy route-map router-balance
```

Define access lists that specify each ToS value set by the Peribit device:

```
access-list 101 permit ip 10.129.30.1 0.0.0.0 0.0.0.0 255.255.255.255 tos
10
access-list 102 permit ip 10.129.30.1 0.0.0.0 0.0.0.0 255.255.255.255 tos
11
```

Match the ToS values with the appropriate next-hop gateways:

```
route-map router-balance permit 10
match ip address 101
set ip next-hop 10.129.20.1

route-map router-balance permit 20
match ip address 102
set ip next-hop 10.129.50.1
```

8. To commit the changes to the running configuration, exit configuration mode and type **commit**. To retain the changes the next time the device is restarted, type **save-config**.

## Configure Route Poll Command

The Peribit device can obtain dynamic routes by periodically polling a Cisco router. To obtain a routing table from a Cisco router, the router must be configured to allow Remote Shell Protocol (*rsh*) access by the Peribit device. The *rsh* protocol allows a user or device to execute commands on a remote system without having to log in. For more information on enabling *rsh* on your Cisco router, refer to the Cisco IOS documentation.

1. To view the current route poll settings:

```
config -run route-poll
```

2. Type the following command to enter the configure route poll mode:

```
config route-poll
```

3. To set the IP address of the Cisco router:

```
set remote-host <IP address>
```

To specify the port number (1 to 1024) defined on the router (the default is 514):

```
set remote-port <1-1024>
```

To set the local user name to match the remote user name defined on the router:

```
set local-user <user name>
```

To set the remote user name to match the local user name defined on the router:

```
set remote-user <user name>
```

To enable or disable route polling (disabled by default):

```
set mode <rsh | none>
```

4. To specify the IP address of a secondary Cisco router to be used when the primary is not available:

```
set sec-remote-host <IP address>
```

To specify the port number (1 to 1024) on the secondary router (the default is 514):

```
set sec remote-port <1-1024>
```

5. To enable or disable the extraction of BGP routes (disabled by default):

```
set allow-bgp-routes <on | off>
```

6. To change the polling frequency (default is every five minutes):

```
set frequency <number of minutes>
```

7. To commit the changes to the running configuration, exit configuration mode and type **commit**. To retain the changes the next time the device is restarted, type **save-config**.

## Configure Security Command

The Security command can be used to restrict access to the Peribit device by IP address, change the packet capture password, lock the front-panel keypad, and disable the Web console and/or the SSH interface.

To define users locally and specify how users are authenticated (locally and/or through RADIUS), refer to [“Configure AAA Command” on page 260](#). To define the RADIUS servers, refer to [“Configure RADIUS Command” on page 292](#).

1. To view the current security settings:

```
show -run security
```

2. Type the following command to enter the configure security mode:

```
config security
```

3. To change the packet-capture password:

```
set packet-capture
```

and then press **Enter**. Type the current password (the default is “peribit”) and press **Enter**. Next, type the new password and press **Enter**.

4. To enable or disable the lock on the front panel keypad on an SR-50, SR-55, or SR-80 (disabled by default):

```
set front-panel <on | off>
```

5. To enable or disable the Web console (enabled by default):

```
set web <on | off | cmsonly>
```

Use `cmsonly` to allow Web access only through the Central Management System (CMS).

To enable or disable the SSH interface (enabled by default):

```
set ssh <on | off >
```

6. To restrict operator access, you can create lists of IP addresses or subnets that are allowed or denied access to the Peribit device. If you enter one allowed IP address, users can log in only from the specified address.

To add an IP address or subnet that is allowed access to this device:

```
add allow-ip-address <IP-address>[/<subnet mask>]
```

Multiple IP addresses must be separated by spaces.

To add an IP address or subnet that is denied access to this device:

```
add deny-ip-address <IP-address>[/<subnet mask>]
```

To remove one or all IP addresses that have access to the device:

```
remove allow-ip-address {all | <IP-address>[/<subnet mask>]}
```

To remove one or all IP addresses that are denied access to the device:

```
remove deny-ip-address {all | <IP-address>[/<subnet mask>]}
```

7. To commit the changes to the running configuration, exit configuration mode and type **commit**. To retain the changes the next time the device is restarted, type **save-config**.

## Configure SNMP Command

Peribit devices support SNMP, the Management Information Base (MIB) II public objects, and Peribit's Private MIB objects. Your Network Management System (NMS) can use Peribit's Private MIB to monitor the performance of the Peribit devices in your network. In addition, enabling SNMP traps on a Peribit device allows the device to send traps and alarms to the NMS as they occur.

1. To view the current SNMP settings:

```
show -run snmp
```

2. Type the following command to enter the configure snmp mode:

```
config snmp
```

3. To enable or disable support for SNMP (enabled by default):

```
set snmp <on | off>
```

4. To enter read and write community strings:

```
set read-community <string>
```

```
set write-community <string>
```

If the string value has spaces, enclose it in double quotation marks.

5. To enable or disable SNMP traps (disabled by default):

```
set trap <on | off>
```

To enter a trap community string:

```
set trap-community <string>
```

To enable or disable traps for authentication failures (disabled by default):

```
set auth-failure-trap <on | off>
```

To enter a trap destination:

```
set trap-destination <IP address>
```

Multiple trap destinations must be separated by spaces.

---

**NOTE:** For a description of each trap, refer to [Appendix C, “SNMP Traps and Syslog Messages” on page 339](#).

---

6. To commit the changes to the running configuration, exit configuration mode and type **commit**. To retain the changes the next time the device is restarted, type **save-config**.

## Configure SNTP Command

Peribit devices support the Simple Network Time Protocol (SNTP). An SNTP server provides a common time base for devices within your network. If your network does not use an SNTP server, you can manually configure the time settings for each Peribit device (refer to [“Configure Clock Command” on page 269](#)).

---

**NOTE:** Before enabling SNTP, use the “show clock” command to verify that the time zone settings are correct. If necessary, use the “configure clock” command to change the time zone settings.

---

To enable SNTP on this device:

1. To view the current SNTP settings:

```
show -run sntp
```

2. Type the following command to enter the configure SNTP mode:

```
config sntp
```

3. To set the SNTP server address:

```
set ip-address <IP address>
```

4. To specify the number of minutes between updates from the time server (the default is 1440):

```
set interval <number>
```

5. To add a secondary SNTP server to be used if the primary is not available:

```
set sec-ip-address <IP address>
```

6. To enable or disable SNTP (disabled by default):

```
set sntp <on | off>
```

7. To commit the changes to the running configuration, exit configuration mode and type **commit**. To retain the changes the next time the device is restarted, type **save-config**.

## Configure Stack-Group Command

The SR-100 can act as a server to distribute the processing load to a “stack” of up to six client Peribit devices. The client devices are connected directly to the SR-100, and can be any mix of SR-50s, SR-55s, and SR-80s (refer to [“Connecting Client Devices to the SR-100” on page 43](#)). Client mode must be enabled manually on each Peribit device connected to an SR-100.

Also, you can increase throughput to a remote Peribit device by configuring up to seven outbound reduction tunnels from the SR-100. You can specify one tunnel for each client, plus one for the SR-100.

1. To view the current configuration:

```
show -run stack-group
```

Note that ports 1 to 6 indicate client devices; port zero indicates the SR-100.

2. To enable or disable client mode on a n SR-50, SR-55, or SR-80 (disabled by default):

```
config stack-group set client-mode <on | off>
```

3. To enable up to seven reduction tunnels from an SR-100 to any remote Peribit device:

```
config stack-group endpoint set ip-address <IP address> max-tunnels <1-7>
```

When enabling multiple tunnels between two SR-100s with clients, specify the number of outbound tunnels on both devices.

---

**NOTE:** Configuring Policy-Based Multi-Path for a remote endpoint overrides multiple reduction tunnels. After Multi-Path is configured, the command to establish multiple tunnels is ignored.

---

## Configure Syslog Command

Peribit devices can send Syslog messages to one or more Syslog servers. A Syslog server allows you to centrally log and analyze configuration events and system error messages such as interface status, security alerts, and environmental conditions.

1. To view the current Syslog settings:

```
show -run syslog
```

2. Type the following command to enter the configure Syslog mode:

```
config syslog
```

3. To enable or disable Syslog (disabled by default):

```
set syslog <on | off>
```

4. To enter the IP address of a Syslog server:

```
set destination <IP address>
```

Multiple Syslog addresses must be separated by spaces. Up to five Syslog servers can be defined.

5. To set the severity of messages uploaded to the Syslog server, specify any combination of “c”, “e”, and “i”:

```
set severity <cei>
```

Do not include spaces between the letters. The letters indicate:

- **Critical.** Critical error messages about software or hardware malfunctions.
- **Error.** Error message, such as License expired.
- **Information.** Informational messages, such as reload requests and low-process stack messages.

---

**NOTE:** For a description of Syslog messages, refer to [Appendix C, “SNMP Traps and Syslog Messages”](#) on page 339.

---

6. To commit the changes to the running configuration, exit configuration mode and type **commit**. To retain the changes the next time the device is restarted, type **save-config**.



## Configure Top Talker Command

The Top Traffic data collection tool continuously collects traffic statistics for the most active traffic flows, including the protocol, source and destination addresses and ports, and the number of packets and bytes sent and received. The collected statistics can be sent to a Cisco NetFlow server or displayed in the Web console (but not both). Undefined application flows displayed in the Web console are flagged so that you can quickly populate application definitions with the correct addresses and ports.

---

**NOTE:** A flow constitutes data sent and/or received from a single source IP address and port number, to a single destination IP address and port number using the same protocol.

---

The Top Traffic utility maintains the 65,000 most active flows. You can view the top 50 flows in the Web console, but the complete list can be exported to a file in CSV format.

1. To view the current Top Talker settings:

```
show -run top-talker
```

2. Type the following to enter the config Top Talker mode:

```
config top-talker
```

3. To export the statistics file to CSV format:

```
export <ftp://<IP address>[:<user>:<pass>]/<path>
```

or

```
export <tftp://<IP address>/<path>
```

To delete the collected data:

```
delete
```

4. To send traffic data to a Cisco NetFlow server:

- a. Specify the IP address and UDP port number of the NetFlow server:

```
netflow set ip-address <IP address> udp-port <number>
```

- b. Enable NetFlow data collection (disabled by default);

```
netflow mode <on | off>
```



## Appendix A Multi-Node Configurations

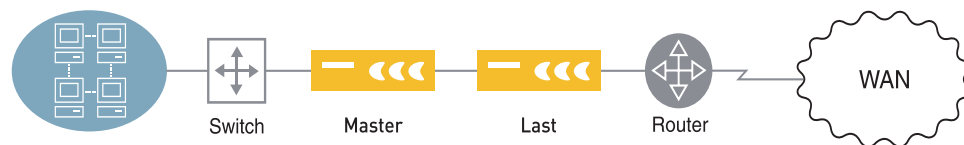
---

This appendix describes how to install Peribit devices in a multi-node configuration. It covers the following topics:

- [“About Multi-Node Configuration” in the next section](#)
- [“Before You Begin” on this page.](#)
- [“Installing Two Peribit Devices in Multi-Node Configuration” on page 316.](#)

### About Multi-Node Configuration

To increase processing capacity on high-speed or heavily congested networks, you can connect client devices to an SR-100 (refer to [“Connecting Client Devices to the SR-100” on page 43](#)), or you can connect two Peribit devices together in a “multi-node” configuration. (Figure A-1).



**Figure A-1 Installing Two Peribit devices in Multi-Node Configuration**

In multi-node configuration, two Peribit devices are connected inline, with one designated as the Master, and the other designated as the Last. The Master connects its Local interface to the switch (or other aggregating device) and its Remote interface to the Local interface of the Last device. The Remote interface of the Last device connects to the edge router.

Multi-node configurations do NOT support:

- Off-path deployments (must be deployed inline, as shown in Figure A-1)
- Outbound QoS on either device (so AFP and NSM also are not supported)
- SR-15s, SR-100s, and SM-500s (only SR-20s, SR-50s, SR-55s, and SR-80s support multi-node)
- Auto-deployment using PeriScope CMS (must be configured on site)

Note that an SR-100 with client devices supports both outbound QoS, AFP, and off-path deployments.

## Before You Begin

Before you install and configure a Peribit device in your network, note the following guidelines:

- Ensure sufficient power is available for the Peribit device. Supply circuits should be protected by a maximum 20A circuit breaker.
- Ensure there is ample space and lighting. You need enough space to insert 2 CAT-5 UTP Ethernet data cables and a power cord (two for the SR-80) into the back of the chassis, and the proper lighting to see link status and speed LEDs on the Ethernet data ports.
- Ensure a minimum of six inches clearance in the front and back of the chassis. Since the Peribit device pulls air for cooling from the front panel, do not install the Peribit device behind another device where warm or hot air may be circulated. There are no ventilation requirements above or below the Peribit device.
- Do not stack paper materials or heavy equipment on top of the Peribit device.
- For rack-mount installations, identify adequate rack space for a 1U form factor device (SR-20) or a 2U form factor device (SR-50, SR-55, and SR-80).
- Reserve an IP address and identify the default gateway for the Peribit device. The default gateway is the next hop on the WAN side of the device.
- Obtain a license key for the device. The license key determines the throughput levels for the device, and properly registers the product with Peribit Networks. To obtain a permanent license key, go to <http://license.peribit.com>.
- Identify a 10/100 (SR-20 or SR-50) or 10/100/1000 (SR-55 or SR-80) Ethernet LAN port where you can connect the Peribit device. This port is typically on an aggregation switch or other LAN device connected directly to the WAN router. The SR-80 also supports fiber interfaces.
- For an SR-20 and SR-50, identify the TX/RX polarity (MDI/MDI-X) of the Ethernet interfaces. This information is useful to determine the kind of cable needed (straight-through or crossover).
- Log in to the router that will be on the WAN side of the Peribit device and make a note of the interface speed and duplex mode.
- If your network restricts specific ports along the communication path between Peribit devices, ensure ports 3577 and 3578 are open for TCP and UDP data transmission.

## Installing Two Peribit Devices in Multi-Node Configuration

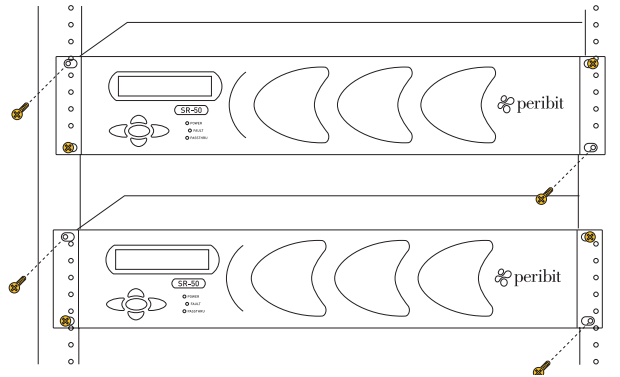
This section describes how to install two Peribit devices in Multi-Node configuration and covers the following topics:

- [“Hardware Installation for Multi-Node Configuration” in the next section](#)
- [“Configuring Network Settings for Multi-Node Configuration” in the next section](#)
- [“Running Quick Setup for Multi-Node Configuration” on page 321.](#)
- [“Displaying the Status of Multi-Node Configuration” on page 324.](#)

## Hardware Installation for Multi-Node Configuration

To install two Peribit devices in multi-node configuration:

1. Set up the Master and Last device chassis.
  - If you plan to install the Peribit devices in a 19-inch device rack, install the supplied brackets (front panel forward) to the sides of the devices with the countersunk screws provided in the kit. Next, install the chassis into your network device rack (Figure A-2).



**Figure A-2 Installing the Peribit Devices into a 19-inch Device Rack**

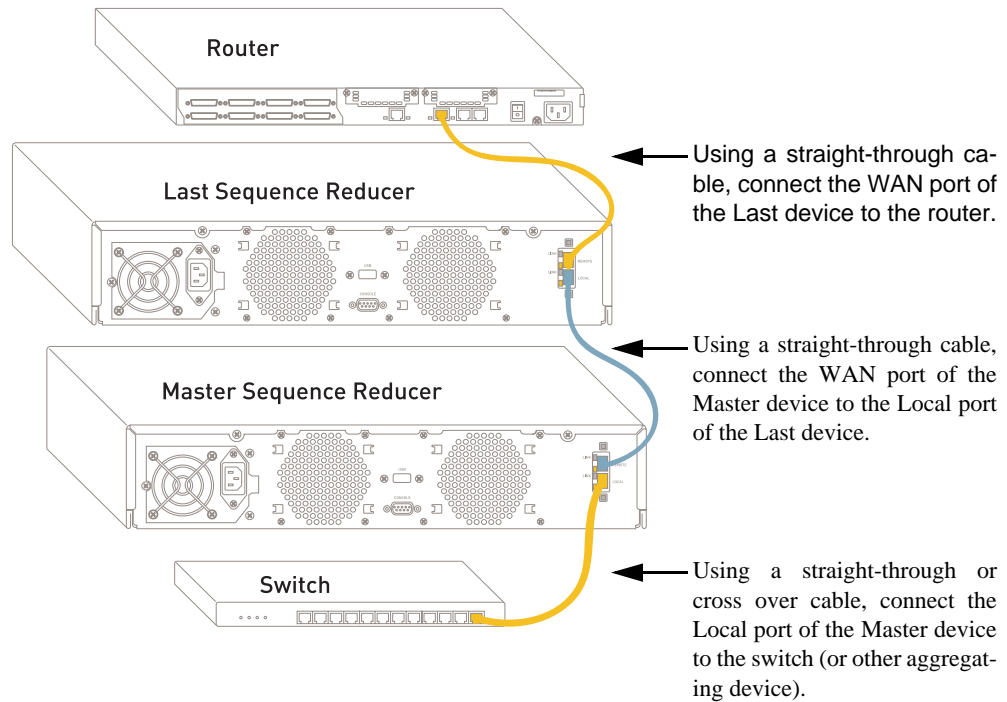
- If you plan to install the Peribit devices on a desktop, place each chassis upside down on a smooth, flat surface. Next, install the supplied rubber feet in the marked areas on the bottom of the chassis. Finally, place the chassis on a desktop or on top of another device so that all four rubber feet are securely mounted to the flat surface.
2. Connect the network cables.

**IMPORTANT:** Do not connect power to either Peribit device until Step 4.

The SR-20 and SR-50 have two 10/100 Ethernet interfaces. The SR-55 and copper SR-80 have two 10/100/1000 Ethernet interfaces. These RJ-45 ports are labeled REMOTE and LOCAL on the back of the chassis. The fiber-optic SR-80 has two 1000 Ethernet interfaces.

Depending on the type of cable (straight-through or crossover) that currently connects a switch (or other aggregating device) to the edge router in your network, perform one of the following:

- If the connection from the router to the LAN device uses a straight-through cable, use a **straight-through** cable to connect the local device (within the Subnet) to the LOCAL port on the Master device. Then use a **straight-through** cable to connect the Remote port of the Master device to the Local port of the Last device. Finally, use a **straight-through** cable to connect the router to the REMOTE port of the Last device.
- If the connection from the router to the LAN device uses a crossover cable, use a **crossover** cable to connect the LAN device (within the Subnet) to the LOCAL port on the Master device. Then use a **straight-through** cable to connect the Remote port of the Master device to the Local port of the Last device. Finally, use a **straight-through** cable to connect the router to the REMOTE port of the Last device.



**Figure A-3 Peribit Device Ethernet Ports**

3. With the power off for both of the Peribit devices, verify connectivity between devices on both sides of the Master and Last devices.

In the event of a power loss, the Peribit devices maintain a hard-wire pass through connectivity. You must verify the connectivity between the devices to ensure the correct network cables are used.

- One method of testing connectivity between devices is to Ping a host on the remote side of the Peribit device from a host on the local side.
  - Another method is to observe the link status LEDs (if available) on the interfaces of the adjacent network devices (switch and router).
4. After verifying connectivity between devices on both sides of the Master and Last devices, connect the power cable to the back of the Master device chassis, and then connect the power cord to the local power source.

---

**NOTE:** The power usage is 150 Watts Max or 510 BTU/hr for the SR-50/SR-55, and 250 Watts Max or 850 BTU/hr for the SR-80/SR-100.

---

5. With the Master device's power on and the Last device's power off, verify connectivity between devices on both sides of the Master and Last devices again.
6. Connect the power cable to the back of the Last device chassis.

Plug in the power cord to the back of the Last device chassis, and then connect the power cord to the local power source.

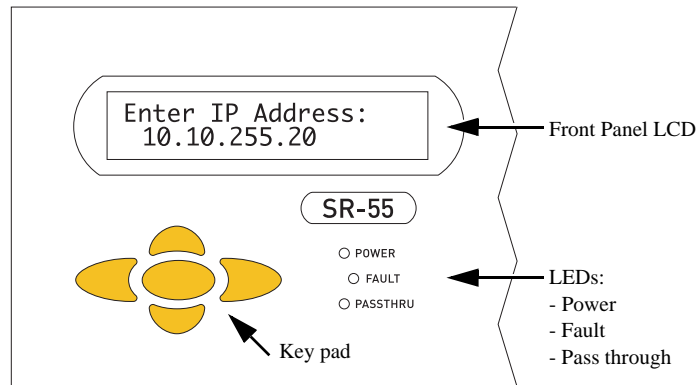
7. With both the Master and Last device's power on, verify connectivity between devices on both sides of the Master and Last devices again.

If the connection test fails, toggle the MDI/MDI-X button (SR-20 and SR-50 only) for the port that does not have the LINK LED illuminated.

## Configuring Network Settings for Multi-Node Configuration

After you have installed and powered on the Master and Last devices, the next step is to configure network settings for each device.

The SR-50, SR-55, and SR-80 have a front-panel keypad and LCD that lets you view and set the network address information for the device. Figure A-4 shows the SR-55 front panel keypad and LCD.



**Figure A-4 SR-55 Front Panel Keypad and LCD**

After you power on the devices, the “Peribit Networks” message appears in the front panel LCD.

To configure the network settings:

1. On the Master device, press the **Enter** button (center button) to initiate the programming.
2. At the “Select Setup Network\_” prompt in the LCD, press **Enter**.
3. Use the front-panel keypad to assign an IP address, the subnet mask, and the default gateway as follows:
  - Use the up and down arrow buttons to display a number (between 0-9).
  - Use the left and right arrow buttons to move to the previous or next character.
  - Use the center button (Enter) to make a selection.

---

**NOTE:** The default gateway is typically the next hop on the Remote side of the device. There can be an exception if you plan to designate a Peribit device as a Default Assembler. After installing the device, review [“Defining Default Assemblers” on page 135](#) for more information.

---

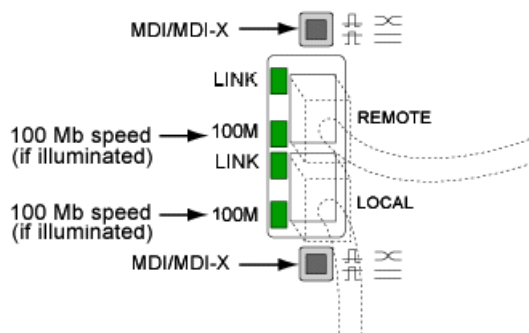
4. By default, the Ethernet interfaces are set to auto-negotiate the speed and duplex mode. However, if the router on the WAN side of the Peribit device has the speed and duplex mode manually set, it is strongly recommended that you configure the Local and/or Remote interface settings. To manually configure the interfaces from the front panel:
  - a. Use the down arrow to show the Config Local IF (Interface) Settings menu option.
  - b. Press the center (Enter) button to select this option.
  - c. Use the down arrow to show the desired interface setting (10/Half, 10/Full, 100/Half, 100/Full). The SR-55 and copper SR-80 also have 1000/Full. The fiber-optic SR-80 supports only 1000/Full.
  - d. Use the down arrow to show the Config Remote IF (Interface) Settings menu option.
  - e. Press the center (Enter) button to select this option.
  - f. Use the down arrow to show the desired interface setting (same options as the Local interface).

---

**NOTE:** After installation, you can change the interface settings from the Web console or CLI if needed.

---

5. After entering network address and interface information, choose to **Commit** and **Save** the device configuration.
6. Check the LEDs next to the Ethernet ports (Figure A-5).



**Figure A-5** Checking the Link LEDs

- If the LINK LEDs light, the device is properly connected. If the LINK LEDs do not light, toggle the MDI/MDI-X buttons (SR-20 and SR-50 only).
  - The other green LEDs for the REMOTE and LOCAL ports indicate 100 Mbps (SR-20 and SR-50) or 100/1000 Mbps (SR-55) connectivity.
7. Repeat these steps for the Last device.

## Running Quick Setup for Multi-Node Configuration

After powering on the Peribit devices and configuring network settings, log in to the Master and Last device and run the Quick Setup program. You can log in from anywhere in the network using an SSH application, or by connecting to the console port on the back of the device and using a terminal emulation program (such as HyperTerminal).



1. Start the SSH or terminal emulation program and enter the IP address of the Master device. At the User name and Password prompts, type **admin** for the user name and **peribit** for the password.

You are now prompted to enter the IP address of the Peribit registration server.

Within a Peribit community, at least one Peribit device must be designated as a registration server. While all Peribit devices are capable of transferring data to one another, the registration server stores information about each device within a Peribit community. All devices within the Peribit community contact the registration server for information on the other devices.

In a multi-node configuration, it is recommended that neither the Master nor the Last device be designated as the registration server.

2. Type the IP address of the current (or future) registration server and press **Enter**. Next, type the registration server password and press **Enter**.

---

**NOTE:** If you have not yet configured the registration server, enter the IP address reserved for the registration server and the default password, “peribit”. After setting up the registration server, you should change the default password for security purposes.

---

3. You are now prompted to change the default password for the administrator user. Note that the default password is “peribit”. For security purposes, you should change this password to restrict unauthorized users from configuring this device.

At the prompt, enter a new administrator password, and then press **Enter**.

4. Enable multi-node configuration for the Master device:
  - a. At the Peribit command prompt, type:

```
show multi-node
```

The multi-node parameters are displayed.

```
-----
10.10.25.240# show multi-node
multi-node: off
Master IP: 0.0.0.0
-----
```

- b. To configure multi-node parameters, type:

```
config multi-node
```

The command prompt now includes (config-multi-node).

- c. Configure this device as the Master:

```
set master-ip <IP address of the Master device>
```

- d. Enable multi-node configuration on this device:

```
set multi-node on
```

Multi-node configuration for the Master device is enabled.

The required parameters are now configured. Type **exit** to exit the multi-node configuration.

5. You should now commit and save the configuration. To commit and save the configuration file with the default name and location, type:

```
commit
```

and then type:

```
save-config
```

The configuration file is saved as “startup.cfg” and will be used if you reboot the device.

To save the configuration file with another name, type:

```
save-config <file name>
```

---

**NOTE:** Do not include the “.cfg” file name extension.

---

6. Type “y” to confirm saving the running configuration as the startup configuration.
7. Type exit to close the terminal emulation session for the Master device.

After the Master device is set up for multi-node configuration, log in to the Last device using an SSH application or a terminal emulation program (such as HyperTerminal), and set up the multi-node parameters.

1. Start the SSH or terminal emulation program and enter the IP address of the Last device. At the User name and Password prompts, type **admin** for the user name and **peribit** for the password.

You are now prompted to enter the IP address of the Peribit registration server.

2. Type the IP address of the current (or future) registration server and press **Enter**. Next, type the registration server password and press **Enter**.

---

**NOTE:** If you have not yet configured the registration server, enter the IP address reserved for the registration server and the default password, “peribit”. After setting up the registration server, you should change the default password for security purposes.

---

3. You are now prompted to change the default password for the administrator user. Note that the default password is “peribit”. For security purposes, you should change this password to restrict unauthorized users from configuring this device.

At the prompt, enter a new administrator password, and then press **Enter**.

4. Enable multi-node configuration for the Last device:

- a. At the Peribit command prompt, type:

```
show multi-node
```

The multi-node parameters are displayed.

```
-----
10.10.25.240# show multi-node
multi-node: off
Master IP: 0.0.0.0
-----
```

- b. To configure multi-node parameters, type:

```
config multi-node
```

The command prompt now includes (config-multi-node).

- c. Configure this device as the Last in the multi-node configuration by specifying the Master device's IP address. At the command prompt, type:

```
set master-ip <IP address of the Master device>
```

- d. Enable multi-node on this device:

```
set multi-node on
```

Multi-node configuration for the Last device is enabled.

The required parameters are now configured. Type `exit` to exit the multi-node configuration.

5. You should now commit and save the configuration. To commit and save the configuration file with the default name and location, type:

```
commit
```

and then type:

```
save-config
```

The configuration file is saved as “startup.cfg” and will be used if you reboot the device.

To save the configuration file with another name, type:

```
save-config <file name>
```

---

**NOTE:** Do not include the “.cfg” file name extension.

---

6. Type “y” to confirm saving the running configuration as the startup configuration.

The Peribit devices are now configured for multi-node operation.

**IMPORTANT:** The Master and the Last device must have the exact same policy configurations.

7. Type `exit` to end the terminal emulation session for the Last device.

## Displaying the Status of Multi-Node Configuration

After you have set up the Peribit devices in multi-node configuration, you can view the status of the multi-node configuration through the Master device's CLI.

1. Log in to the Master device using an SSH application or a terminal emulation program (such as HyperTerminal).

2. At the CLI command prompt, type `show multi-node-status`.

```

-----
Multi-node Status:
Number of nodes: 2
IP address of last node: 10.10.25.240
IP address of master node: 10.10.26.240
Overall instant rate: 36380
Average rate overall: 72788
Average rate per node: 36394
Previous pass through: 0
Current pass through: 0
Master node active status: on
Master node average rate: 34344
Master node instant rate: 33662
Master node pass through: 0
Last node active status: on
Last node average rate: 38444
Last node instant rate: 39646
Last node pass through: 0
Number of flows processed in master node: 104
Number of flows processed in last node: 152
Total number of flows: 256
-----

```

The multi-node status report shows the configuration of the multi-node devices, the average rate (in packets per second), the instant rate (in packets per second) and the number of flows processed by each node.

3. Type `exit` to end the terminal emulation session for the Master device, or use other commands to configure policies for the device.

**IMPORTANT:** The Master and the Last devices must have the exact same policy configurations.

After installing and configuring the Peribit devices for multi-node configuration, you should enter permanent license keys for the Master and Last devices. The license key determines the throughput levels for the device. For information on entering a license key, refer to [“Configure License Command” on page 276](#).

In addition, you should review the reduction subnet settings. By default the local subnet on which the Peribit device is installed is not advertised to the other devices in the Peribit community. As a result, data destined for this subnet is not reduced even if there are Peribit devices in the path. For more information on configuring reduction subnets, refer to [“Configure Reduction Subnets Command” on page 301](#).

## Appendix B Peribit Device Specifications

---

This appendix lists the technical specifications for the following Peribit devices:

- [“SR-15 Specifications” in the next section](#)
- [“SR-20 Specifications” on page 327](#)
- [“SR-50 and SR-55 Specifications” on page 329](#)
- [“SR-80 and SR-100 Specifications” on page 331](#)
- [“SM-250 Specifications” on page 333](#)
- [“SM-500 Specifications” on page 335](#)
- [“DB9 Console Port Pin-Outs” on page 337](#)

### SR-15 Specifications

**Table B-1 SR-15 Specifications**

| Product Features                    | SR-15                                                                                        |
|-------------------------------------|----------------------------------------------------------------------------------------------|
| Protocols supported                 | Any IP-based traffic (TCP, UDP, GRE, etc.)                                                   |
| Operator-defined passthrough filter | Yes, by application or address. Passes native (non-reduced) data at wire speed.              |
| Installation                        | In-Line between aggregation switch and edge router or off WAN router                         |
| System                              |                                                                                              |
| Network interfaces                  | Two auto-sensing 10/100 BaseT Ethernet interfaces                                            |
| On-board Flash storage              | Yes, no spinning media                                                                       |
| Performance                         |                                                                                              |
| Total reduction throughput speed    | Supports WAN speeds up to 1 Mbps                                                             |
| Maximum connections                 | Up to 2 SR/SM connections, 2 IPSec tunnels, and 2 virtual end-points                         |
| Application definitions             | Up to 100 application definitions                                                            |
| Routes                              | Up to 1000 routes                                                                            |
| Quality of Service (QoS)            |                                                                                              |
| Honor, preserve and/or set ToS/DSCP | Yes, retain settings or prioritize using ToS/DiffServ values by application                  |
| Bandwidth allocation                | Yes, create traffic classes for bandwidth allocation with time of day option                 |
| Application Acceleration            |                                                                                              |
| Packet Flow Acceleration (PFA)      | Flow Pipelining, Active Flow Pipelining, Fast Connection Setup, and Forward Error Correction |

**Table B-1 SR-15 Specifications (Continued)**

|                                   |                                                                                                                                                |
|-----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Management</b>                 |                                                                                                                                                |
| SNMP, Syslog                      | Yes, SNMPv2c, MIB II, Peribit Enterprise MIB and syslog                                                                                        |
| Secure remote access              | SSH and HTTPS (SSL)                                                                                                                            |
| <b>Monitoring</b>                 |                                                                                                                                                |
| Reduction statistics              | Per device, per application, and per destination; both real-time and historical                                                                |
| QoS, bandwidth management         | Per destination, per traffic class, real-time and historical                                                                                   |
| Acceleration                      | TCP session time and throughput; both real-time and historical                                                                                 |
| Data export                       | Yes, CSV format and NetFlow version 5 records                                                                                                  |
| Application reporting             | Detail by IP addresses, and/or port numbers, and/or IP protocol, and/or DSCP/ToS value, with greater detail by URL element or application type |
| Network upgradeable               | Yes, via FTP, HTTP and TFTP                                                                                                                    |
| Fault tolerant non-stop operation | Yes, 10/100 BaseT auto switch-to-wire on any power, hardware, or software failure condition                                                    |
| High availability                 | Yes, a backup device can support multiple primary devices                                                                                      |
| Power                             | AC power 100-240v, 50-60Hz, 50 Watts Max or 170 BTU/hr                                                                                         |
| <b>Dimensions and Weight</b>      |                                                                                                                                                |
| Height                            | 44 mm (1.75 in.): 1 rack unit                                                                                                                  |
| Width                             | 390 mm (15.3 in.)                                                                                                                              |
| Depth                             | 230 mm (9.1 in.)                                                                                                                               |
| Weight                            | 1.8 kg (4 lb.)                                                                                                                                 |
| <b>Operating Environment</b>      |                                                                                                                                                |
| Temperature                       | 5° C to 40° C                                                                                                                                  |
| Humidity                          | Less than 90% relative humidity, non-condensing                                                                                                |
| <b>Regulations</b>                |                                                                                                                                                |
| Emissions                         | FCC Class A, EN 55022 Class A, EN 55024 Immunity                                                                                               |
| Safety                            | CSA C22.2 No. 950 M95, UL 1950 3 Edition, EN 60950                                                                                             |

## SR-20 Specifications

**Table B-2 SR-20 Specifications**

| <b>Product Features</b>             | <b>SR-20</b>                                                                                                                                   |
|-------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|
| Protocols supported                 | Any IP-based traffic (TCP, UDP, GRE, etc.)                                                                                                     |
| Operator-defined passthrough filter | Yes, by application or address. Passes native (non-reduced) data at wire speed.                                                                |
| Installation                        | In-Line between aggregation switch and edge router or off WAN router                                                                           |
| <b>System</b>                       |                                                                                                                                                |
| Network interfaces                  | Two auto-sensing 10/100 BaseT Ethernet interfaces                                                                                              |
| On-board Flash storage              | Yes, no spinning media                                                                                                                         |
| <b>Performance</b>                  |                                                                                                                                                |
| Total reduction throughput speed    | Supports WAN speeds up to 2 Mbps                                                                                                               |
| Maximum connections                 | Up to 5 SR/SM connections, 5 IPSec tunnels, and 10 virtual end-points                                                                          |
| Application definitions             | Up to 256 application definitions                                                                                                              |
| Routes                              | Up to 8K routes                                                                                                                                |
| <b>Quality of Service (QoS)</b>     |                                                                                                                                                |
| Honor, preserve and/or set ToS/DSCP | Yes, retain settings or prioritize using ToS/DiffServ values by application                                                                    |
| Bandwidth allocation                | Yes, create traffic classes for bandwidth allocation with time of day option                                                                   |
| <b>Application Acceleration</b>     |                                                                                                                                                |
| Packet Flow Acceleration (PFA)      | Flow Pipelining, Active Flow Pipelining, Fast Connection Setup, and forward error correction                                                   |
| <b>Management</b>                   |                                                                                                                                                |
| SNMP, Syslog                        | Yes, SNMPv2c, MIB II, Peribit Enterprise MIB and syslog                                                                                        |
| Secure remote access                | SSH and HTTPS (SSL)                                                                                                                            |
| <b>Monitoring</b>                   |                                                                                                                                                |
| Reduction statistics                | Per device, per application, and per destination; both real-time and historical                                                                |
| QoS, bandwidth management           | Per destination, per traffic class, real-time and historical                                                                                   |
| Acceleration                        | TCP session time and throughput; both real-time and historical                                                                                 |
| Data export                         | Yes, CSV format and NetFlow version 5 records                                                                                                  |
| Application reporting               | Detail by IP addresses, and/or port numbers, and/or IP protocol, and/or DSCP/ToS value, with greater detail by URL element or application type |
| Network upgradeable                 | Yes, via FTP, HTTP and TFTP                                                                                                                    |
| Fault tolerant non-stop operation   | Yes, 10/100 BaseT auto switch-to-wire on any power, hardware, or software failure condition                                                    |

**Table B-2 SR-20 Specifications (Continued)**

|                              |                                                           |
|------------------------------|-----------------------------------------------------------|
| High availability            | Yes, a backup device can support multiple primary devices |
| Power                        | AC power 110-230v, 47-63Hz, 150 Watts Max or 510 BTU/hr   |
| <b>Dimensions and Weight</b> |                                                           |
| Height                       | 44 mm (1.8 in.): 1rack unit                               |
| Width                        | 435 mm (17.1 in.)                                         |
| Depth                        | 363 mm (14.3 in.)                                         |
| Weight                       | 8.6 kg (19 lb.)                                           |
| <b>Operating Environment</b> |                                                           |
| Temperature                  | 5° C to 40° C                                             |
| Humidity                     | Less than 90% relative humidity, non-condensing           |
| <b>Regulations</b>           |                                                           |
| Emissions                    | FCC Class A, EN 55022 Class A, EN 55024 Immunity          |
| Safety                       | CSA C22.2 No. 950 M95, UL 1950 3 Edition, EN 60950        |



## SR-50 and SR-55 Specifications

**Table B-3 SR-50 & SR-55 Specifications**

| <b>Product Features</b>             |  | <b>SR-50 and SR-55</b>                                                                                                                         |
|-------------------------------------|--|------------------------------------------------------------------------------------------------------------------------------------------------|
| Protocols supported                 |  | Any IP-based traffic (TCP, UDP, GRE, etc.)                                                                                                     |
| Operator-defined passthrough filter |  | Yes, by application or address. Passes native (non-reduced) data at wire speed.                                                                |
| Installation                        |  | In-Line between aggregation switch and edge router or off WAN router                                                                           |
| <b>System</b>                       |  |                                                                                                                                                |
| Network interfaces                  |  | SR-50: Two auto-sensing 10/100 BaseT Ethernet interfaces<br>SR-55: Two auto-sensing 10/100/1000 BaseT Ethernet ports                           |
| On-board Flash storage              |  | Yes, no spinning media                                                                                                                         |
| <b>Performance</b>                  |  |                                                                                                                                                |
| Total reduction throughput speed    |  | Supports WAN speeds up to 20 Mbps                                                                                                              |
| Maximum connections                 |  | Up to 120 SR/SM connections, 100 IPSec tunnels, and 100 virtual endpoints                                                                      |
| Application definitions             |  | Up to 256 application definitions                                                                                                              |
| Routes                              |  | Up to 8K routes                                                                                                                                |
| <b>Quality of Service (QoS)</b>     |  |                                                                                                                                                |
| Honor, preserve and/or set ToS/DSCP |  | Yes, retain settings or prioritize using ToS/DiffServ values by application                                                                    |
| Bandwidth allocation                |  | Yes, create traffic classes for bandwidth allocation with time of day option                                                                   |
| <b>Application Acceleration</b>     |  |                                                                                                                                                |
| Packet Flow Acceleration (PFA)      |  | Flow Pipelining, Active Flow Pipelining, Fast Connection Setup, and forward error correction                                                   |
| <b>Management</b>                   |  |                                                                                                                                                |
| SNMP, Syslog                        |  | Yes, SNMPv2c, MIB II, Peribit Enterprise MIB and syslog                                                                                        |
| Secure remote access                |  | SSH and HTTPS (SSL)                                                                                                                            |
| <b>Monitoring</b>                   |  |                                                                                                                                                |
| Reduction statistics                |  | Per device, per application, and per destination; both real-time and historical                                                                |
| QoS, bandwidth management           |  | Per destination, per traffic class, real-time and historical                                                                                   |
| Acceleration                        |  | TCP session time and throughput; both real-time and historical                                                                                 |
| Data export                         |  | Yes, CSV format and NetFlow version 5 records                                                                                                  |
| Application reporting               |  | Detail by IP addresses, and/or port numbers, and/or IP protocol, and/or DSCP/ToS value, with greater detail by URL element or application type |
| Network upgradeable                 |  | Yes, via FTP, HTTP and TFTP                                                                                                                    |

**Table B-3 SR-50 & SR-55 Specifications (Continued)**

|                                   |                                                                                                  |
|-----------------------------------|--------------------------------------------------------------------------------------------------|
| Fault tolerant non-stop operation | Yes, 10/100/1000 BaseT auto switch-to-wire on any power, hardware, or software failure condition |
| High availability                 | Yes, a backup device can support multiple primary devices                                        |
| Power                             | AC power 100-240v, 50-60Hz, 150 Watts Max or 510 BTU/hr                                          |
| <b>Dimensions and Weight</b>      |                                                                                                  |
| Height                            | 88 mm (3.44 in.): 2 rack units                                                                   |
| Width                             | 435 mm (17.1 in.)                                                                                |
| Depth                             | 425 mm (16.7 in.)                                                                                |
| Weight                            | 9.2 kg (20.2 lb.)                                                                                |
| <b>Operating Environment</b>      |                                                                                                  |
| Temperature                       | 5° C to 40° C                                                                                    |
| Humidity                          | Less than 90% relative humidity, non-condensing                                                  |
| <b>Regulations</b>                |                                                                                                  |
| Emissions                         | FCC Class A, EN 55022 Class A, EN 55024 Immunity                                                 |
| Safety                            | CSA C22.2 No. 950 M95, UL 1950 3 Edition, EN 60950                                               |

## SR-80 and SR-100 Specifications

**Table B-4 SR-80 and SR-100 Specifications**

| <b>Product Features</b>             | <b>SR-80 and SR-100</b>                                                                                              |
|-------------------------------------|----------------------------------------------------------------------------------------------------------------------|
| Protocols supported                 | Any IP-based traffic (TCP, UDP, GRE, etc.)                                                                           |
| Operator-defined passthrough filter | Yes, by application or address. Passes native (non-reduced) data at wire speed.                                      |
| Installation                        | In-Line between aggregation switch and edge router or off WAN router                                                 |
| <b>System</b>                       |                                                                                                                      |
| Network interfaces                  | Two auto-sensing 10/100/1000 BaseT Ethernet interfaces<br>or<br>Two 1000 Base-SX multimode fiber Ethernet interfaces |
| Client interfaces (SR-100 only)     | Up to six SR-50s, SR-55s, and SR-80s can be connected to the SR-100                                                  |
| On-board Flash storage              | Yes, no spinning media                                                                                               |
| <b>Performance</b>                  |                                                                                                                      |
| Total reduction throughput speed    | Supports WAN speeds up to 20 Mbps (SR-80) and 155 Mbps (SR-100)                                                      |
| Maximum connections                 | Up to 320 SR/SM connections, 100 IPSec tunnels, and 100 virtual endpoints                                            |
| Application definitions             | Up to 256 application definitions                                                                                    |
| Routes                              | Up to 8K routes                                                                                                      |
| <b>Quality of Service (QoS)</b>     |                                                                                                                      |
| Honor, preserve and/or set ToS/DSCP | Yes, retain settings or prioritize using ToS/DiffServ values by application                                          |
| Bandwidth allocation                | Yes, create traffic classes for bandwidth allocation with time of day option                                         |
| <b>Application Acceleration</b>     |                                                                                                                      |
| Packet Flow Acceleration (PFA)      | Flow Pipelining, Active Flow Pipelining, Fast Connection Setup, and Forward Error Correction                         |
| <b>Management</b>                   |                                                                                                                      |
| SNMP, Syslog                        | Yes, SNMPv2c, MIB II, Peribit Enterprise MIB and syslog                                                              |
| Secure remote access                | SSH and HTTPS (SSL)                                                                                                  |
| <b>Monitoring</b>                   |                                                                                                                      |
| Reduction statistics                | Per device, per application, and per destination; both real-time and historical                                      |
| QoS, bandwidth management           | Per destination, per traffic class, real-time and historical                                                         |
| Acceleration                        | TCP session time and throughput; both real-time and historical                                                       |
| Data export                         | Yes, CSV format and NetFlow version 5 records                                                                        |

**Table B-4 SR-80 and SR-100 Specifications (Continued)**

|                                   |                                                                                                                                                |
|-----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|
| Application reporting             | Detail by IP addresses, and/or port numbers, and/or IP protocol, and/or DSCP/ToS value, with greater detail by URL element or application type |
| Network upgradeable               | Yes, via FTP, HTTP and TFTP                                                                                                                    |
| Fault tolerant non-stop operation | Yes, 10/100/1000 BaseT auto switch-to-wire on any power, hardware, or software failure condition                                               |
| High availability                 | Yes, a backup device can support multiple primary devices                                                                                      |
| Power                             | Dual AC power 115-240v, 50-60Hz, 250 Watts Max or 850 BTU/hr.                                                                                  |
| <b>Dimensions and Weight</b>      |                                                                                                                                                |
| Height                            | 88 mm (3.44 in.): 2 rack units                                                                                                                 |
| Width                             | 435 mm (17.1 in.)                                                                                                                              |
| Depth                             | 524 mm (20.6in.)                                                                                                                               |
| Weight                            | 13.6 kg (30 lb.)                                                                                                                               |
| <b>Operating Environment</b>      |                                                                                                                                                |
| Temperature                       | 5° C to 40° C                                                                                                                                  |
| Humidity                          | Less than 90% relative humidity, non-condensing                                                                                                |
| <b>Regulations</b>                |                                                                                                                                                |
| Emissions                         | FCC Class A, EN 55022 Class A, EN 55024 Immunity                                                                                               |
| Safety                            | CSA C22.2 No. 60950, UL 60950, EN 60950                                                                                                        |

## SM-250 Specifications

**Table B-5 SM-250 Specifications**

| <b>Product Features</b>             |  | <b>SM-250</b>                                                                                                                                  |
|-------------------------------------|--|------------------------------------------------------------------------------------------------------------------------------------------------|
| Protocols supported                 |  | Any IP-based traffic (TCP, UDP, GRE, etc.)                                                                                                     |
| Operator-defined passthrough filter |  | Yes, by application or address. Passes native (non-reduced) data at wire speed.                                                                |
| Installation                        |  | In-Line between aggregation switch and edge router or off WAN router                                                                           |
| <b>System</b>                       |  |                                                                                                                                                |
| Network interfaces                  |  | Two auto-sensing 10/100 BaseT Ethernet ports with MDI/MDI-X switch                                                                             |
| On-board Flash storage              |  | Yes                                                                                                                                            |
| Disk drives                         |  | One 40 GB hard disk drive                                                                                                                      |
| <b>Performance</b>                  |  |                                                                                                                                                |
| Total reduction throughput speed    |  | Supports WAN speeds up to 2 Mbps                                                                                                               |
| Maximum connections                 |  | Up to 15 SR/SM connections, 15 IPSec tunnels, 5 virtual endpoints, and 20 WAN monitoring endpoints                                             |
| Application definitions             |  | Up to 256 application definitions                                                                                                              |
| Routes                              |  | Up to 8K routes                                                                                                                                |
| <b>Quality of Service (QoS)</b>     |  |                                                                                                                                                |
| Honor, preserve and/or set ToS/DSCP |  | Yes, retain settings or prioritize using ToS/DiffServ values by application                                                                    |
| Bandwidth allocation                |  | Yes, create traffic classes for bandwidth allocation with time of day option                                                                   |
| <b>Traffic Acceleration</b>         |  |                                                                                                                                                |
| Packet Flow Acceleration (PFA)      |  | Active Flow Pipelining, Fast Connection Setup, and Forward Error Correction                                                                    |
| Application Flow Acceleration       |  | Microsoft CIFS, Microsoft Exchange, and HTTP                                                                                                   |
| <b>Management</b>                   |  |                                                                                                                                                |
| SNMP, Syslog                        |  | Yes, SNMPv2c, MIB II, Peribit Enterprise MIB and syslog                                                                                        |
| Secure remote access                |  | SSH and HTTPS (SSL)                                                                                                                            |
| <b>Monitoring</b>                   |  |                                                                                                                                                |
| Reduction statistics                |  | Per device, per application, and per destination; both real-time and historical                                                                |
| QoS, bandwidth management           |  | Per destination, per traffic class, real-time and historical                                                                                   |
| Acceleration                        |  | TCP session time and throughput; both real-time and historical                                                                                 |
| Data export                         |  | Yes, CSV format and NetFlow version 5 records                                                                                                  |
| Application reporting               |  | Detail by IP addresses, and/or port numbers, and/or IP protocol, and/or DSCP/ToS value, with greater detail by URL element or application type |

**Table B-5 SM-250 Specifications (Continued)**

|                                   |                                                                                             |
|-----------------------------------|---------------------------------------------------------------------------------------------|
| Network upgradeable               | Yes, via FTP, HTTP and TFTP                                                                 |
| Fault tolerant non-stop operation | Yes, 10/100 BaseT auto switch-to-wire on any power, hardware, or software failure condition |
| High availability                 | Yes, a backup device can support multiple primary devices                                   |
| Power                             | AC power 100-240v, 50-60Hz, 150 Watts Max or 510 BTU/hr                                     |
| <b>Dimensions and Weight</b>      |                                                                                             |
| Height                            | 44 mm (1.8 in.): 1rack unit                                                                 |
| Width                             | 435 mm (17.1 in.)                                                                           |
| Depth                             | 363 mm (14.3 in.)                                                                           |
| Weight                            | 9.5 kg (21 lb.)                                                                             |
| <b>Operating Environment</b>      |                                                                                             |
| Temperature                       | 5° C to 40° C                                                                               |
| Humidity                          | Less than 90% relative humidity, non-condensing                                             |
| <b>Regulations</b>                |                                                                                             |
| Emissions                         | FCC Class A, EN 55022 Class A, EN 55024 Immunity                                            |
| Safety                            | CSA C22.2 No. 950 M95, UL 1950 3 Edition, EN 60950                                          |

# SM-500 Specifications

**Table B-6 SM-500 Specifications**

| <b>Product Features</b>             |  | <b>SM-500</b>                                                                                                                                  |
|-------------------------------------|--|------------------------------------------------------------------------------------------------------------------------------------------------|
| Protocols supported                 |  | Any IP-based traffic (TCP, UDP, GRE, etc.)                                                                                                     |
| Operator-defined passthrough filter |  | Yes, by application or address. Passes native (non-reduced) data at wire speed.                                                                |
| Installation                        |  | In-Line between aggregation switch and edge router or off WAN router                                                                           |
| <b>System</b>                       |  |                                                                                                                                                |
| Network interfaces                  |  | Two auto-sensing 10/100/1000 BaseT Ethernet ports                                                                                              |
| On-board Flash storage              |  | Yes                                                                                                                                            |
| Disk drives                         |  | Two 250 GB hard disk drives                                                                                                                    |
| <b>Performance</b>                  |  |                                                                                                                                                |
| Total reduction throughput speed    |  | Supports WAN speeds up to 20 Mbps                                                                                                              |
| Maximum connections                 |  | Up to 60 connections to other SMs, 60 IPSec/SM tunnels, and 60 virtual endpoints                                                               |
| Application definitions             |  | Up to 256 application definitions                                                                                                              |
| Routes                              |  | Up to 8K routes                                                                                                                                |
| <b>Quality of Service (QoS)</b>     |  |                                                                                                                                                |
| Honor, preserve and/or set ToS/DSCP |  | Yes, retain settings or prioritize using ToS/DiffServ values by application                                                                    |
| Bandwidth allocation                |  | Yes, create traffic classes for bandwidth allocation with time of day option                                                                   |
| <b>Application Acceleration</b>     |  |                                                                                                                                                |
| Packet Flow Acceleration (PFA)      |  | Flow Pipelining, Active Flow Pipelining, Fast Connection Setup, and forward error correction                                                   |
| <b>Management</b>                   |  |                                                                                                                                                |
| SNMP, Syslog                        |  | Yes, SNMPv2c, MIB II, Peribit Enterprise MIB and syslog                                                                                        |
| Secure remote access                |  | SSH and HTTPS (SSL)                                                                                                                            |
| <b>Monitoring</b>                   |  |                                                                                                                                                |
| Reduction statistics                |  | Per device, per application, and per destination; both real-time and historical                                                                |
| QoS, bandwidth management           |  | Per destination, per traffic class, real-time and historical                                                                                   |
| Acceleration                        |  | TCP session time and throughput; both real-time and historical                                                                                 |
| Data export                         |  | Yes, CSV format and NetFlow version 5 records                                                                                                  |
| Application reporting               |  | Detail by IP addresses, and/or port numbers, and/or IP protocol, and/or DSCP/ToS value, with greater detail by URL element or application type |
| Network upgradeable                 |  | Yes, via FTP, HTTP and TFTP                                                                                                                    |

**Table B-6 SM-500 Specifications (Continued)**

|                                   |                                                                                                  |
|-----------------------------------|--------------------------------------------------------------------------------------------------|
| Fault tolerant non-stop operation | Yes, 10/100/1000 BaseT auto switch-to-wire on any power, hardware, or software failure condition |
| High availability                 | Yes, a backup device can support multiple primary devices                                        |
| Power                             | AC power 100-240v, 50-60Hz, 150 Watts Max or 510 BTU/hr                                          |
| <b>Dimensions and Weight</b>      |                                                                                                  |
| Height                            | 88 mm (3.44 in.): 2 rack units                                                                   |
| Width                             | 435 mm (17.1 in.)                                                                                |
| Depth                             | 425 mm (16.7 in.)                                                                                |
| Weight                            | 9.2 kg (20.2 lb.)                                                                                |
| <b>Operating Environment</b>      |                                                                                                  |
| Temperature                       | 5° C to 40° C                                                                                    |
| Humidity                          | Less than 90% relative humidity, non-condensing                                                  |
| <b>Regulations</b>                |                                                                                                  |
| Emissions                         | FCC Class A, EN 55022 Class A, EN 55024 Immunity                                                 |
| Safety                            | CSA C22.2 No. 950 M95, UL 1950 3 Edition, EN 60950                                               |



## DB9 Console Port Pin-Outs

The following tables list the pin-outs for a null-modem cable used to connect the DB9 console port to a DB9 or DB25 terminal port. Applies to all Peribit devices.

**Table B-7 DB9 to DB9 Cable**

| Console Port                    | DB9 | DB9 | Terminal Port                   |
|---------------------------------|-----|-----|---------------------------------|
| Receive Data                    | 2   | 3   | Transmit Data                   |
| Transmit Data                   | 3   | 2   | Receive Data                    |
| Data Terminal Ready             | 4   | 6+1 | Data Set Ready + Carrier Detect |
| System Ground                   | 5   | 5   | System Ground                   |
| Data Set Ready + Carrier Detect | 6+1 | 4   | Data Terminal Ready             |
| Request to Send                 | 7   | 8   | Clear to Send                   |
| Clear to Send                   | 8   | 7   | Request to Send                 |

**Table B-8 DB9 to DB25 Cable**

| Console Port                    | DB9 | DB25 | Terminal Port                   |
|---------------------------------|-----|------|---------------------------------|
| Receive Data                    | 2   | 2    | Transmit Data                   |
| Transmit Data                   | 3   | 3    | Receive Data                    |
| Data Terminal Ready             | 4   | 6+8  | Data Set Ready + Carrier Detect |
| System Ground                   | 5   | 7    | System Ground                   |
| Data Set Ready + Carrier Detect | 6+1 | 20   | Data Terminal Ready             |
| Request to Send                 | 7   | 5    | Clear to Send                   |
| Clear to Send                   | 8   | 4    | Request to Send                 |



## Appendix C SNMP Traps and Syslog Messages

This appendix describes the SNMP Traps generated by Peribit devices, and describes the messages that are sent to a Syslog server (if configured).

### SNMP Traps

Table C-1 lists the generic traps supported by Peribit SRS software.

**Table C-1 Generic SNMP Traps**

| Trap          | Description                                                                                                       |
|---------------|-------------------------------------------------------------------------------------------------------------------|
| Cold Start    | The device was restarted.                                                                                         |
| LAN Link Up   | Indicates the Local interface link has been established.                                                          |
| LAN Link Down | Indicates the Local interface link has failed. Verify that the link state change was not due to a network error.  |
| WAN Link Up   | Indicates the Remote interface link has been established.                                                         |
| WAN Link Down | Indicates the Remote interface link has failed. Verify that the link state change was not due to a network error. |

Table C-2 lists the enterprise specific traps supported by Peribit SRS software.

**Table C-2 Enterprise-specific SNMP Traps**

| Event                             | Description/Recommended Action                                                                                                                                 |
|-----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| pnCommonEventInFailSafeMode       | Indicates that the device was restarted in Safe Mode. Safe Mode operation keeps the device powered on, but all traffic is passed through without reduction.    |
| pnCommonEventPowerSupplyFailure   | One or more sources of power to the system has failed. A redundant power-supply has presumably taken over.                                                     |
| pnCommonEventPowerSupplyOk        | One or more previously failed sources of power is now working normally. The transition to normal condition happened without the system having to be restarted. |
| pnCommonEventLicenseExpired       | Software license has expired. Data reduction/assembly has been disabled. Please contact Peribit Networks to obtain a permanent license                         |
| pnCommonEventThruputLimitExceeded | Exceeded licensed throughput. Please contact Peribit Networks to obtain a new license with a higher speed.                                                     |
| pnCommonEventLicenseWillExpire    | Software license will expire soon. If you are using an evaluation license, contact Peribit Networks to obtain a permanent license.                             |
| pnCommonEventLoginFailure         | Verify the user is authorized to administer the device. Any unauthorized access should be treated as a serious problem.                                        |

**Table C-2 Enterprise-specific SNMP Traps (Continued)**

| Event                                        | Description/Recommended Action                                                                                                                                                                                                                                                                                                                                                                      |
|----------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| pnCommonEventFaultTolerantPassThrough        | An anomalous health condition was detected. It would have subsequently triggered hardware pass through mode followed by a reboot.                                                                                                                                                                                                                                                                   |
| pnCommonEventFanFailure                      | A cooling fan inside the device has failed. The 'pnCommonEventDescr' object has the name of the fan that failed.                                                                                                                                                                                                                                                                                    |
| pnCommonEventFanSpeedVariation               | The speed of a cooling fan inside the device is either too low or too high. The 'pnCommonEventDescr' object has the name of the fan that has the problem.                                                                                                                                                                                                                                           |
| pnCommonEventFanOk                           | A cooling fan inside the device that had previously failed or whose speed variation was high is now working properly. The 'pnCommonEventDescr' object has the name of the fan that has recovered.                                                                                                                                                                                                   |
| pnCommonEventInterfaceSpeedMismatch          | A mismatch is detected between the local and remote interface settings. This can happen due to a mismatch in the local and remote interface speed or mode.                                                                                                                                                                                                                                          |
| pnCommonEventInterfaceSpeedOk                | A mismatch previously detected between the local and remote interface settings is now resolved. The local and remote interface speed and mode are matched.                                                                                                                                                                                                                                          |
| pnCommonEventInterfaceDuplexMismatch         | <p>A possible mismatch was detected between the duplex setting of either the local or remote interface and that of the device attached to that interface. The interface (local or remote) is identified by the 'pnCommonEventDescr' object.</p> <p>This notification is different from InterfaceSpeedMismatch event, which compares the local and remote interfaces on the same Peribit device.</p> |
| pnCommonEventIpsecSecurityAssociationAdded   | An IPsec security association has been negotiated and added to security association database.                                                                                                                                                                                                                                                                                                       |
| pnCommonEventIpsecSecurityAssociationDeleted | An IPsec security association has been deleted from the security association database.                                                                                                                                                                                                                                                                                                              |
| pnCommonEventIpsecSecurityAssociationExpired | An IPsec security association has expired.                                                                                                                                                                                                                                                                                                                                                          |
| pnSrEventRipAuthFailure                      | Indicates that a RIP packet received from a device could not be authenticated. Check the authentication information on the Peribit device and the sending device.                                                                                                                                                                                                                                   |
| pnSrEventReducerBufferOverflow               | The reduction input buffer is approaching full capacity.                                                                                                                                                                                                                                                                                                                                            |
| pnSrEventReducerSessionClosed                | The reducer session to the device described in pnCommonEventDescr was terminated.                                                                                                                                                                                                                                                                                                                   |
| pnSrEventAssemblerSessionClosed              | The assembler session to the device described in pnCommonEventDescr was terminated.                                                                                                                                                                                                                                                                                                                 |
| pnSrEventReducerSessionOpened                | The reducer session to the device described in pnCommonEventDescr was opened.                                                                                                                                                                                                                                                                                                                       |

**Table C-2 Enterprise-specific SNMP Traps (Continued)**

| Event                                  | Description/Recommended Action                                                                                                                                                                                                                                                                                                 |
|----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| pnSrEventAssemblerSessionOpened        | The assembler session to the device described in pnCommonEventDescr was opened.                                                                                                                                                                                                                                                |
| pnSrEventPrimaryRegServerUnreachable   | The primary registration server is currently unreachable.                                                                                                                                                                                                                                                                      |
| pnSrEventSecondaryRegServerUnreachable | The secondary registration server is currently unreachable.                                                                                                                                                                                                                                                                    |
| pnSrEventMultiNodeMasterUp             | <p>The system designated as the 'master' of a multi-node configuration came up. This notification is generated by the system that's designated as the 'master' of the multi-node.</p> <p>Note that the corresponding Down notification is generated by the designated 'master-backup' of the same multi-node.</p>              |
| pnSrEventMultiNodeMasterDown           | <p>The system designated as the 'master' of a multi-node configuration is currently down. This notification is generated by the system that's designated as the 'master-backup' of the same multi-node.</p> <p>Note that the corresponding Up notification is generated by the designated 'master' of the same multi-node.</p> |
| pnSrEventMultiNodeLastUp               | <p>The system designated as the 'last-node' of a multi-node came up. This notification is generated by the system that's designated as the 'last-node' of the multi-node.</p> <p>Note that the corresponding Down notification is generated by the designated 'master' of the same multi-node.</p>                             |
| pnSrEventMultiNodeLastDown             | <p>The system designated as the 'last-node' of a multi-node is currently down. This notification is generated by the system that's designated as the 'master' of the same multi-node.</p> <p>Note that the corresponding Up notification is generated by the designated 'last-node' of the same multi-node.</p>                |
| pnSrEventMultiPathStatusChange         | The primary or secondary path to another multipath-enabled system became inactive or failed. This may have caused traffic designated to flow over this path to be switched to or from this path.                                                                                                                               |
| pnSrEventPrimaryDownBackupEngaged      | The system designated as the 'primary' is currently unreachable. This notification is generated by the system that's designated as the 'backup' device. The backup device is engaged for the primary device.                                                                                                                   |
| pnSrEventPrimaryDownBackupEngageFailed | The system designated as the 'primary' is currently unreachable. This notification is generated by the system that's designated as the 'backup' device. The backup device failed to engage for the primary device.                                                                                                             |
| pnSrEventPrimaryUpBackupDisengaged     | The system designated as the 'primary' is currently reachable. This notification is generated by the system that's designated as the 'backup' device. The backup device has disengaged.                                                                                                                                        |

## Syslog Messages

Table C-3 lists the Syslog messages generated by Peribit devices.

**Table C-3 Syslog Messages**

|                           |                                                                                                                                                                                                                                    |
|---------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Message ID</b>         | 101: PN_LIC_LICENSE_WILL_EXPIRE_SOON_ID                                                                                                                                                                                            |
| <b>Message</b>            | License will expire on <date>                                                                                                                                                                                                      |
| <b>Message Type</b>       | Informational                                                                                                                                                                                                                      |
| <b>Recommended Action</b> | Once the license expires, please contact Peribit Networks at +1-866-737-4248 (866-PERIBIT) to obtain a new license.                                                                                                                |
| <b>Message ID</b>         | 102: PN_LIC_SPEED_THRESHOLD_EXCEEDED_ID                                                                                                                                                                                            |
| <b>Message</b>            | Exceeded licensed throughput                                                                                                                                                                                                       |
| <b>Message Type</b>       | Error                                                                                                                                                                                                                              |
| <b>Recommended Action</b> | Contact Peribit Networks at +1-866-737-4248 (866-PERIBIT) to obtain a new license with speed configured to a higher value                                                                                                          |
| <b>Message ID</b>         | 103: PN_LIC_LICENSE_EXPIRED_ID                                                                                                                                                                                                     |
| <b>Message</b>            | License expired, Data reduction/assembly has been disabled                                                                                                                                                                         |
| <b>Message Type</b>       | Error                                                                                                                                                                                                                              |
| <b>Recommended Action</b> | Contact Peribit Networks at 866 737-4248 (866-PERIBIT) to obtain a new license                                                                                                                                                     |
| <b>Message ID</b>         | 602: PN_ROUTING_RIP_AUTH_FAIL                                                                                                                                                                                                      |
| <b>Message</b>            | “RIP Authentication failed from <IPAddr>”, where <IPAddr> is the address of the machine for which we could not authenticate the packet                                                                                             |
| <b>Message Type</b>       | Informational                                                                                                                                                                                                                      |
| <b>Recommended Action</b> | Check the RIP authentication settings on the Peribit device and the <IPAddr> machine.                                                                                                                                              |
| <b>Message ID</b>         | 902: PN_REDUCER_PASSTHRU_INFO_ID                                                                                                                                                                                                   |
| <b>Message</b>            | SR: Connection state set to pass through for ip=<ip address>.                                                                                                                                                                      |
| <b>Message Type</b>       | Informational.                                                                                                                                                                                                                     |
| <b>Recommended Action</b> | Heartbeats are missed for device <ip address>.                                                                                                                                                                                     |
| <b>Message ID</b>         | 903: PN_REDUCER_END_SESSION_INFO_ID                                                                                                                                                                                                |
| <b>Message</b>            | SR: Session closed - ip=<ip address> sesid=<id>.                                                                                                                                                                                   |
| <b>Message Type</b>       | Informational                                                                                                                                                                                                                      |
| <b>Recommended Action</b> | Reducer session to device <ip address> has ended. If this is not user triggered action such as policy change or reboot, then check network connectivity to the device. The log file on the system provides additional information. |

Table C-3 Syslog Messages (Continued)

|                           |                                                                                                                                                                                                                                     |
|---------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Message ID</b>         | 904: PN_REDUCER_OVERFLOW_INFO_IND                                                                                                                                                                                                   |
| <b>Message</b>            | SR: Reducer buffer is reaching full capacity                                                                                                                                                                                        |
| <b>Message Type</b>       | Informational                                                                                                                                                                                                                       |
| <b>Recommended Action</b> | If the situation persists, reduce the traffic entering the reducer. Appropriate traffic filter may also be used to reduce the amount of packets to be processed by reducer.                                                         |
| <b>Message ID</b>         | 1002: PN_ASSEMBLER_END_SESSION_INFO_ID                                                                                                                                                                                              |
| <b>Message</b>            | SA: Session closed - ip=<ip address> sesid=<id>.                                                                                                                                                                                    |
| <b>Message Type</b>       | Informational                                                                                                                                                                                                                       |
| <b>Recommended Action</b> | Assembler session to device <ip address> has ended. If this is not user triggered action such as policy change or reboot, then check network connectivity to the device. The log file on the system provides additional information |
| <b>Message ID</b>         | 1102: PN_REGISTER_PRIMARY_SELFREG_ERROR_ID                                                                                                                                                                                          |
| <b>Message</b>            | REG: Self registration failed. IP=<ip address>.                                                                                                                                                                                     |
| <b>Message Type</b>       | Error                                                                                                                                                                                                                               |
| <b>Recommended Action</b> | Check the network connectivity to primary registration server <ip address>.                                                                                                                                                         |
| <b>Message ID</b>         | 1103: PN_REGISTER_SEC_SELFREG_ERROR_ID                                                                                                                                                                                              |
| <b>Message</b>            | REG: Self registration failed for secondary registration server. IP=<ip address>.                                                                                                                                                   |
| <b>Message Type</b>       | Error                                                                                                                                                                                                                               |
| <b>Recommended Action</b> | Check the network connectivity to secondary registration server <ip address>.                                                                                                                                                       |
| <b>Message ID</b>         | 1104: PN_REGISTER_PRIMARY_SELFREG_INFO_ID                                                                                                                                                                                           |
| <b>Message</b>            | REG: Self registration completed. IP=<ip address>.                                                                                                                                                                                  |
| <b>Message Type</b>       | Informational                                                                                                                                                                                                                       |
| <b>Recommended Action</b> | None                                                                                                                                                                                                                                |
| <b>Message ID</b>         | 1105: PN_REGISTER_SEC_SELFREG_INFO_ID                                                                                                                                                                                               |
| <b>Message</b>            | REG: Self registration completed for secondary registration server. IP=<ip address>.                                                                                                                                                |
| <b>Message Type</b>       | Informational                                                                                                                                                                                                                       |
| <b>Recommended Action</b> | None                                                                                                                                                                                                                                |

**Table C-3 Syslog Messages (Continued)**

|                           |                                                                                                                                                                                                                                                                                                                                       |
|---------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Message ID</b>         | 1106: PN_REGISTER_PASSWORD_MISMATCH_ERROR_ID                                                                                                                                                                                                                                                                                          |
| <b>Message</b>            | REG: Registration failed. Password mismatch. IP=<ip address>                                                                                                                                                                                                                                                                          |
| <b>Message Type</b>       | Error                                                                                                                                                                                                                                                                                                                                 |
| <b>Recommended Action</b> | The device <ip address> does not have the correct registration server password. It can be corrected from CLI or Web console.                                                                                                                                                                                                          |
| <b>Message ID</b>         | 1202: PN_BRIDGE_GENERIC_HARDENING_ERROR_ID                                                                                                                                                                                                                                                                                            |
| <b>Message</b>            | Health monitor detected anomalous system condition                                                                                                                                                                                                                                                                                    |
| <b>Message Type</b>       | Error                                                                                                                                                                                                                                                                                                                                 |
| <b>Recommended Action</b> | The health monitoring system detected an unexpected error condition. The health monitoring system will take corrective action and attempt to restore proper operating condition, including if necessary performing a system reset. Please contact Peribit Networks technical support at 1-866-PERIBIT to further analyze the anomaly. |
| <b>Message ID</b>         | 1203: PN_BRIDGE_LOCAL_LINK_UP_INFO_ID                                                                                                                                                                                                                                                                                                 |
| <b>Message</b>            | Local interface: Link Up, <speed>, <duplex mode>                                                                                                                                                                                                                                                                                      |
| <b>Message Type</b>       | Informational                                                                                                                                                                                                                                                                                                                         |
| <b>Recommended Action</b> | None                                                                                                                                                                                                                                                                                                                                  |
| <b>Message ID</b>         | 1204: PN_BRIDGE_LOCAL_LINK_DOWN_INFO_ID                                                                                                                                                                                                                                                                                               |
| <b>Message</b>            | Local interface: Link Down                                                                                                                                                                                                                                                                                                            |
| <b>Message Type</b>       | Informational                                                                                                                                                                                                                                                                                                                         |
| <b>Recommended Action</b> | Verify that the link state change was not due to a network error.                                                                                                                                                                                                                                                                     |
| <b>Message ID</b>         | 1205: PN_BRIDGE_REMOTE_LINK_UP_INFO_ID                                                                                                                                                                                                                                                                                                |
| <b>Message</b>            | Remote interface: Link Up, <speed>, <duplex mode>                                                                                                                                                                                                                                                                                     |
| <b>Message Type</b>       | Informational                                                                                                                                                                                                                                                                                                                         |
| <b>Recommended Action</b> | None                                                                                                                                                                                                                                                                                                                                  |
| <b>Message ID</b>         | 1206: PN_BRIDGE_REMOTE_LINK_DOWN_INFO_ID                                                                                                                                                                                                                                                                                              |
| <b>Message</b>            | Remote interface: Link Down                                                                                                                                                                                                                                                                                                           |
| <b>Message Type</b>       | Informational                                                                                                                                                                                                                                                                                                                         |
| <b>Recommended Action</b> | Verify that the link state change was not due to a network error.                                                                                                                                                                                                                                                                     |



Table C-3 Syslog Messages (Continued)

|                           |                                                                                                                                                                                                                                              |
|---------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Message ID</b>         | 1402: PN_CTRL_BACKUP_PRIMARY_DOWN_ENGAGED_ERROR_ID                                                                                                                                                                                           |
| <b>Message</b>            | BACKUP: No response from Primary device IP=< ip address>. Backup is engaged.                                                                                                                                                                 |
| <b>Message Type</b>       | Error                                                                                                                                                                                                                                        |
| <b>Recommended Action</b> | Heartbeats missed from Primary device. Please check the health of the primary.                                                                                                                                                               |
| <b>Message ID</b>         | 1403: PN_CTRL_BACKUP_PRIMARY_DOWN_NOTENGAGED_ERROR_ID                                                                                                                                                                                        |
| <b>Message</b>            | BACKUP: No response from Primary device IP=< ip address>. Failed to engage backup.                                                                                                                                                           |
| <b>Message Type</b>       | Error                                                                                                                                                                                                                                        |
| <b>Recommended Action</b> | Heartbeats missed from Primary device. Please check the health of the primary device. The log file on the system provides additional information on the failure to engage the backup device (startup configuration file not available etc.). |
| <b>Message ID</b>         | 1404: PN_CTRL_BACKUP_PRIMARY_UP_DISENGAGED_INFO_ID                                                                                                                                                                                           |
| <b>Message</b>            | BACKUP: Response received from Primary device IP=<ip address>. Backup is disengaged.                                                                                                                                                         |
| <b>Message Type</b>       | Informational                                                                                                                                                                                                                                |
| <b>Recommended Action</b> | None. The connectivity to primary device is restored.                                                                                                                                                                                        |
| <b>Message ID</b>         | 1702: PN_MGMT_STARTUP_CONFIG_SAVED_ID                                                                                                                                                                                                        |
| <b>Message</b>            | SaveStartupConfig: Saved successfully                                                                                                                                                                                                        |
| <b>Message Type</b>       | Informational                                                                                                                                                                                                                                |
| <b>Recommended Action</b> | Verify that someone authorized to configure the system saved the configuration.                                                                                                                                                              |
| <b>Message ID</b>         | 1703: PN_MGMT_CONFIG_SAVE_FAILURE_ID                                                                                                                                                                                                         |
| <b>Message</b>            | SaveConfig: Cannot save <module> settings: status=<status>                                                                                                                                                                                   |
| <b>Message Type</b>       | Error                                                                                                                                                                                                                                        |
| <b>Recommended Action</b> | Contact Peribit Networks at +1-866-737-4248 (866-PERIBIT) with the information.                                                                                                                                                              |
| <b>Message ID</b>         | 1802: PN_INIT_IN_SAFE_MODE_ID                                                                                                                                                                                                                |
| <b>Message</b>            | Safe-mode suspend: case 2                                                                                                                                                                                                                    |
| <b>Message Type</b>       | Critical Error*                                                                                                                                                                                                                              |
| <b>Recommended Action</b> | Contact Peribit support.<br><br>* Note that this message is also sent if you explicitly reboot the system into Safe Mode from the Web console or the Command Line Interface (CLI).                                                           |

**Table C-3 Syslog Messages (Continued)**

|                           |                                                                                                                                                                                                                                                                                                                     |
|---------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Message ID</b>         | 1803: PN_INIT_COLD_START_ID                                                                                                                                                                                                                                                                                         |
| <b>Message</b>            | Cold Start                                                                                                                                                                                                                                                                                                          |
| <b>Message Type</b>       | Informational                                                                                                                                                                                                                                                                                                       |
| <b>Recommended Action</b> | If the Peribit device restarted unexpectedly, please investigate the reason. Contact Peribit support if there seems to be a problem.                                                                                                                                                                                |
| <b>Message ID</b>         | 1902: PN_SECURITY_LOGIN_FAILURE_ID                                                                                                                                                                                                                                                                                  |
| <b>Message</b>            | Login failed: access=<method> user=<name> IP=<ip-addr>                                                                                                                                                                                                                                                              |
| <b>Message Type</b>       | Error                                                                                                                                                                                                                                                                                                               |
| <b>Recommended Action</b> | The message has the access method (CONSOLE, SSH, or WEB) and the IP address of the client (for SSH and WEB). You can check if the user is authorized to configure this system. Since CONSOLE access requires physical access to the system, any unauthorized CONSOLE access should be treated as a serious problem. |
| <b>Message ID</b>         | 1903: PN_SECURITY_LOGIN_SUCCESS_ID                                                                                                                                                                                                                                                                                  |
| <b>Message</b>            | Login ok: access=<method> user=<name> IP=<ip-addr>                                                                                                                                                                                                                                                                  |
| <b>Message Type</b>       | Informational                                                                                                                                                                                                                                                                                                       |
| <b>Recommended Action</b> | Please verify that the person who logged in was someone authorized to configure the system.                                                                                                                                                                                                                         |
| <b>Message ID</b>         | 2002: PN_FAN_FAILURE_ERROR                                                                                                                                                                                                                                                                                          |
| <b>Message</b>            | Fan Error (CPU or Chassis fan not operational).                                                                                                                                                                                                                                                                     |
| <b>Message Type</b>       | Error                                                                                                                                                                                                                                                                                                               |
| <b>Recommended Action</b> | CPU or chassis fan may not be working, and may need to be replaced.                                                                                                                                                                                                                                                 |
| <b>Message ID</b>         | 2003: PN_FAN_SPEED_VARIATION_ERROR                                                                                                                                                                                                                                                                                  |
| <b>Message</b>            | Fan Speed Error (Cpu or Chassis speed variation).                                                                                                                                                                                                                                                                   |
| <b>Message Type</b>       | Error                                                                                                                                                                                                                                                                                                               |
| <b>Recommended Action</b> | The fan may need to be replaced.                                                                                                                                                                                                                                                                                    |
| <b>Message ID</b>         | 2004: PN_FAN_OK                                                                                                                                                                                                                                                                                                     |
| <b>Message</b>            | Fan OK (CPU or Chassis).<br>Fan OK (CPU or Chassis fan speed normal)                                                                                                                                                                                                                                                |
| <b>Message Type</b>       | Informational                                                                                                                                                                                                                                                                                                       |
| <b>Recommended Action</b> | The CPU or chassis fan has recovered from a previous failure, such as fan speed variation or fan failure error. No action is required.                                                                                                                                                                              |
| <b>Message ID</b>         | 2102: PN_MULTINODE_MASTER_NODE_UP_ID                                                                                                                                                                                                                                                                                |

Table C-3 Syslog Messages (Continued)

|                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|---------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Message</b>            | SR: Multi-Node Master Node is Up                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Message Type</b>       | Informational                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Recommended Action</b> | This message indicates that the master node is up. No action.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Message ID</b>         | 2103: PN_MULTINODE_MASTER_NODE_DOWN_ID                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Message</b>            | SR: Multi-Node Master Node is Down                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Message Type</b>       | Error                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Recommended Action</b> | If this master node was not taken down intentionally, check the running configuration and the network connectivity.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Message ID</b>         | 2104: PN_MULTINODE_LAST_NODE_UP_ID                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Message</b>            | SR: Multi-Node Last Node is Up                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Message Type</b>       | Informational                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Recommended Action</b> | This message indicates that the last node is up. No action is required.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Message ID</b>         | 2105 (PN_MULTINODE_LAST_NODE_DOWN_ID)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Message</b>            | SR: Multi-Node Last Node is Down                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Message Type</b>       | Error                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Recommended Action</b> | If this last node was not taken down intentionally, check the running configuration and the network connectivity.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Message ID</b>         | 2501: PN_IPSEC_GENERIC_ERROR_ID                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Message</b>            | <p>One of the following:</p> <ul style="list-style-type: none"> <li>• IPsec Added SA &lt;source Peribit IP address&gt; -&gt; &lt;destination Peribit IP address&gt;s : SPI &lt;SPI number&gt; &lt;encryption algorithm&gt; &lt;authentication algorithm&gt;<br/>Hours Remaining 24.00 MBytes Remaining 100.00</li> <li>• IPsec Expired SA &lt;source Peribit IP address&gt; -&gt; &lt;destination Peribit IP address&gt;s : SPI &lt;SPI number&gt; due to &lt;"life time" or "data life time"&gt;</li> <li>• IPsec Deleted SA &lt;source Peribit IP address&gt; -&gt; &lt;destination Peribit IP address&gt;s : SPI &lt;SPI number&gt;</li> </ul> |
| <b>Message Type</b>       | Informational                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Recommended Action</b> | These messages indicate when IPsec security associations are added, expired, and deleted. No action is required.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

**Table C-3 Syslog Messages (Continued)**

|                           |                                                                                                                                                         |
|---------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Message ID</b>         | 2601: PN_MISC_DISK_FAILURE_ID                                                                                                                           |
| <b>Message</b>            | Disk </ata2 or /ata3> failed initialization! WARNING: Disk disabled - performance will degrade                                                          |
| <b>Message Type</b>       | Informational                                                                                                                                           |
| <b>Recommended Action</b> | NSM continues without this disk, but with some loss in the percentage of data reduction. If both disks fail, NSM reverts to MSR. No action is required. |

## Appendix D Understanding Exported Data Results

This appendix describes the NetFlow packets and performance data that can be exported by a Peribit device, and covers the following sections:

- [“NetFlow Version 5 Export” on this page](#)
- [“Performance Statistics Export” on page 350](#)

### NetFlow Version 5 Export

Top top traffic data can be exported to a Cisco NetFlow server in Version 5 format (refer to [“Viewing and Exporting Top Traffic Statistics” on page 222](#)).

Table D-1 describes the NetFlow packet header.

**Table D-1 NetFlow Packet Header**

| Byte  | Parameter         | Description                                                         |
|-------|-------------------|---------------------------------------------------------------------|
| 0-1   | Version           | NetFlow export format version number (5).                           |
| 2-3   | Count             | Number of flows exported in this packet (1 to 30).                  |
| 4-7   | Sysuptime         | Number of milliseconds since the Peribit device was restarted.      |
| 8-11  | Unix seconds      | Number of seconds since 0000 1970 Coordinated Universal Time (UTC). |
| 12-15 | Unix nanoseconds  | Residual nanoseconds since 0000 1970 UTC.                           |
| 16-19 | Flow number       | Sequence counter of total flows seen.                               |
| 20    | Engine type       | Not applicable.                                                     |
| 21    | Engine ID         | Not applicable.                                                     |
| 22-23 | Sampling interval | Not applicable.                                                     |

Table D-2 describes each traffic flow entry in a NetFlow packet (up to 30 entries per packet).

**Table D-2 NetFlow Packet Entry**

| Byte  | Parameter | Description                            |
|-------|-----------|----------------------------------------|
| 0-3   | Srcaddr   | Source IP address.                     |
| 4-7   | Dstaddr   | Destination IP address.                |
| 8-11  | Nexthop   | Not applicable.                        |
| 12-13 | Input     | SNMP index number of input interface.  |
| 14-15 | Output    | SNMP index number of output interface. |
| 16-19 | Packets   | Number of packets in the flow.         |

**Table D-2 NetFlow Packet Entry**

| Byte  | Parameter          | Description                                              |
|-------|--------------------|----------------------------------------------------------|
| 20-23 | Octets             | Number of Layer 3 bytes in the flow.                     |
| 24-27 | First              | SysUptime at start of flow.                              |
| 28-31 | Last               | SysUptime when the last packet in the flow was received. |
| 32-33 | Source port        | TCP/UDP source port number or equivalent.                |
| 34-35 | Destination port   | TCP/UDP destination port number or equivalent.           |
| 36    | Pad1               | Unused (zero).                                           |
| 37    | TCP flags          | Cumulative OR of TCP flags.                              |
| 38    | Protocol           | IP protocol number (for example, TCP = 6; UDP = 17).     |
| 39    | ToS                | IP type of service.                                      |
| 40-41 | Source system      | Not applicable.                                          |
| 42-43 | Destination system | Not applicable.                                          |
| 44    | Source mask        | Not applicable.                                          |
| 45    | Destination mask   | Not applicable.                                          |
| 46-47 | Pad2               | Unused (zero).                                           |

## Performance Statistics Export

The following sections describe the performance data that can be exported in CSV format (refer to [“Exporting Performance Data” on page 242](#)).

- [“General Device Information” in the next section](#)
- [“System Session Statistics” on page 351](#)
- [“Reduction Session Statistics” on page 353](#)
- [“Application Session Statistics” on page 354](#)
- [“Bandwidth Management Statistics” on page 355](#)
- [“Inbound Traffic By Port Statistics” on page 356](#)

## General Device Information

Table D-3 describes the general device CSV exported information.

**Table D-3 General Device Information**

| Parameter                    | Description                                                                 |
|------------------------------|-----------------------------------------------------------------------------|
| Device IP                    | IP address of the Peribit device.                                           |
| Software version             | Version of SRS software that was running when the statistics were exported. |
| Serial number                | Serial number of the Peribit device that exported the statistics.           |
| License speed                | Licensed speed of the Peribit device.                                       |
| Monitored applications       | Names of the applications being monitored.                                  |
| Flow Pipelining applications | Names of the applications using Flow Pipelining.                            |
| Fast Connection applications | Names of the applications using Fast Connection Setup.                      |
| Prime time enabled           | Indicates whether prime time is enabled (Y or N).                           |
| Prime time hours             | Hours of the day when prime time starts and ends (in 24-hour format).       |
| Prime time days              | Days of the week included in prime time.                                    |
| Operation mode               | Indicates whether the device is active (Inline) or in Profile mode.         |
| IP=                          | IP address of the Peribit device.                                           |
| device local time=           | Local date and time of the export.                                          |
| GMT time=                    | Date and time of the export in Greenwich Mean Time (GMT).                   |
| Peak interval = 5            | Peak statistics are calculated over 5 second intervals.                     |

## System Session Statistics

Table D-4 describes the system session CSV exported statistics.

**Table D-4 System Session Statistics**

| Parameter          | Description                                                                                                                |
|--------------------|----------------------------------------------------------------------------------------------------------------------------|
| Start Time         | Start time for statistics generation.                                                                                      |
| End Time           | End time for statistics generation.                                                                                        |
| Bytes Into AE      | Number of bytes that entered the Assembly Engine.                                                                          |
| Bytes Out AE       | Number of bytes out of the Assembly Engine after assembly.                                                                 |
| Packets Into AE    | Number of packets into the Assembly Engine.                                                                                |
| Packets Out AE     | Number of packets out of the Assembly Engine after assembly.                                                               |
| Resvd 1            | Reserved                                                                                                                   |
| Bytes Out OOB      | Number of out-of-band bytes sent to the control channel.                                                                   |
| Bytes PT NO AE     | Number of bytes that passed through without reduction due to no remote Assembly Engine (Peribit device).                   |
| Packets PT NO AE   | Number of packets that passed through without reduction due to no remote Assembly Engine.                                  |
| Bytes PT By Filter | Number of bytes that passed through without reduction due to a manually configured filter (such as an application filter). |

**Table D-4 System Session Statistics (Continued)**

|                                         |                                                                                                                                                                     |
|-----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Packets PT By Filter                    | Number of packets that passed through without reduction due to a manually configured filter (such as an application filter).                                        |
| OfPt Bytes<br>(Overflow Pass-through)   | Number of bytes that passed through without reduction due to device buffer overflow.                                                                                |
| OfPt Packets<br>(Overflow Pass-through) | Number of packets that passed through without reduction due to device buffer overflow.                                                                              |
| Bytes PT NO SR                          | Number of bytes that passed through without reduction due to a disabled reduction engine on this device.                                                            |
| Packets PT NO SR                        | Number of packets that passed through without reduction due to a disabled reduction engine on this device.                                                          |
| Bytes PT NON-IP                         | Number of non-IP bytes that passed through without reduction (e.g., IPX, etc.).                                                                                     |
| Packets PT NON-IP                       | Number of non-IP packets that passed through without reduction (e.g., IPX, etc.).                                                                                   |
| Bytes PT IP-Other                       | Number of IP bytes that passed through without reduction because the protocols were not configured for reduction.                                                   |
| Packets PT IP-Other                     | Number of IP packets that passed through without reduction because the protocols were not configured for reduction.                                                 |
| Bytes PT SR                             | Number of bytes that passed through without reduction because the source address is the address of another Peribit device in the same community.                    |
| Packets PT SR                           | Number of packets that passed through without reduction because the source address is the address of another Peribit device in the same community.                  |
| Bytes PT SR-Hash                        | Number of bytes that passed through without reduction because the device is part of a reduction cluster and the data will be processed by another Peribit device.   |
| Packets PT SR-Hash                      | Number of packets that passed through without reduction because the device is part of a reduction cluster and the data will be processed by another Peribit device. |
| Bytes PT IpFrag                         | Number of bytes that passed through without reduction because the device is not enabled to reduce IP fragments.                                                     |
| Packets PT IpFrag                       | Number of packets that passed through without reduction because the device is not enabled to reduce IP fragments.                                                   |
| Bytes PT License                        | Number of bytes that passed through without reduction because the throughput level exceeded the device's license.                                                   |
| Packets PT License                      | Number of packets that passed through without reduction because the throughput level exceeded the device's license.                                                 |
| Bytes PT Tunneled Only                  | Number of bytes that passed through without reduction.                                                                                                              |
| Packets PT Tunneled Only                | Number of packets that passed through without reduction.                                                                                                            |
| Bytes PT VLAN                           | Number of bytes of VLAN traffic that passed through without reduction.                                                                                              |
| Packets PT VLAN                         | Number of packets of VLAN traffic that passed through without reduction.                                                                                            |
| Bytes PT L2Mcast                        | Number of Layer 2 Multicast bytes that passed through the device.                                                                                                   |
| Packets PT L2Mcast                      | Number of Layer 2 Multicast packets that passed through the device.                                                                                                 |
| TP Bytes In (throughput)                | Number of bytes into the Reduction Engine at the peak five-second interval of data input <sup>1</sup> .                                                             |
| TP Bytes Out (throughput)               | Number of bytes out of the Reduction Engine at the peak five-second interval of data input.                                                                         |
| TP Bytes PT (throughput)                | Number of bytes that passed through at the peak five-second interval of data input.                                                                                 |
| TP Packets In (throughput)              | Number of packets into the Reduction Engine at the peak five-second interval of data input.                                                                         |



**Table D-4 System Session Statistics (Continued)**

|                             |                                                                                                                                                                                                                                                                                                                                                                          |
|-----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| TP Packets Out (throughput) | Number of packets out of the Reduction Engine at the peak five-second interval of data input.                                                                                                                                                                                                                                                                            |
| TP Packets PT (throughput)  | Number of packets that passed through at the peak five-second interval of data input.                                                                                                                                                                                                                                                                                    |
| Resvd 2                     | Reserved                                                                                                                                                                                                                                                                                                                                                                 |
| Resvd 3                     | Reserved                                                                                                                                                                                                                                                                                                                                                                 |
| Peak % Rdn                  | Maximum data reduction rate for any five second interval within the selected time period. Peak percentage reduction is calculated by the following formula:<br><br>$10^5 \times \left( \frac{\text{Bytes In} - \text{Bytes Out}}{\text{Bytes In}} \right) = \text{Peak \% Reduction}$                                                                                    |
| Rsv H1 through Rsv H20      | Reserved                                                                                                                                                                                                                                                                                                                                                                 |
| PkIn1 to PkIn6              | Six fields that show the number of packets in each of six packet-size ranges for traffic into the Peribit device, as follows: <ul style="list-style-type: none"> <li>• PkIn1 Less than 64 bytes</li> <li>• PkIn2 64 to 127</li> <li>• PkIn3 128 to 255</li> <li>• PkIn4 256 to 511</li> <li>• PkIn5 512 to 1023</li> <li>• PkIn6 More than 1023 bytes</li> </ul>         |
| PkOut1 to PkOut6            | Six fields that show the number of packets in each of six packet-size ranges for traffic out of the Peribit device, as follows: <ul style="list-style-type: none"> <li>• PkOut1 Less than 64 bytes</li> <li>• PkOut2 64 to 127</li> <li>• PkOut3 128 to 255</li> <li>• PkOut4 256 to 511</li> <li>• PkOut5 512 to 1023</li> <li>• PkOut6 More than 1023 bytes</li> </ul> |

T. Data input is the number of IP bytes into the Peribit device from the Local port.

## Reduction Session Statistics

Table D-5 describes the reduction session CSV exported statistics.

**Table D-5 Reduction Session Statistics**

| Parameter                       | Description                                                                                           |
|---------------------------------|-------------------------------------------------------------------------------------------------------|
| Start Time                      | Start time for statistics generation.                                                                 |
| End Time                        | End time for statistics generation.                                                                   |
| Dst Ip (Destination IP Address) | IP address of the remote Peribit device that receives reduced and/or encrypted data from this device. |
| Packets In                      | Number of packets into this reduction engine that were intended for the destination IP address.       |
| Packets Out                     | Number of reduced packets sent to the destination IP address.                                         |
| Packets Into Ipsec              | Number of packets that were identified for encryption and intended for the destination IP address.    |

**Table D-5 Reduction Session Statistics (Continued)**

|                         |                                                                                                                    |
|-------------------------|--------------------------------------------------------------------------------------------------------------------|
| Packets Out of Isec     | Number of encrypted packets sent to the destination IP address.                                                    |
| Packets Dropped by Isec | Number of packets intended for the destination IP address that were dropped according to the default IPsec policy. |
| Isec Overhead           | Number of bytes added by IPsec processing.                                                                         |

## Application Session Statistics

Table D-6 describes the application session CSV exported statistics.

**Table D-6 System Session Statistics**

| Parameter           | Description                                                                                                                                                                                                                            |
|---------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Start Time          | Start time for statistics generation.                                                                                                                                                                                                  |
| End Time            | End time for statistics generation.                                                                                                                                                                                                    |
| App Id              | Application from which the data was received (e.g., FTP, HTTP, Lotus Notes).                                                                                                                                                           |
| Dst Ip              | IP address of the Peribit device that receives reduced data from this device.                                                                                                                                                          |
| Bytes In            | Number of bytes into the device that have been identified for reduction, and addressed for the Peribit device listed with the destination IP address and application ID.                                                               |
| Bytes Out           | Number of bytes out of this device after reduction, and addressed for the Peribit device listed with the destination IP address and application ID.                                                                                    |
| Acc Bytes In        | Number of bytes eligible for Flow Pipelining.                                                                                                                                                                                          |
| Est Boost Bytes     | Estimated number of bytes accelerated by Flow Pipelining.                                                                                                                                                                              |
| Active Session time | Number of milliseconds during which data was sent for all Flow Pipelining sessions that ended during this time period.                                                                                                                 |
| Session Count       | Number of all sessions that ended during this time period.                                                                                                                                                                             |
| Avg % FC Speedup    | Sum of the average percentages of time saved for each session by Fast Connection Setup. To get the average session speedup time shown on the Acceleration report, divide this value by the number of sessions, and then divide by 100. |
| FP Session Count    | Number of Flow Pipelining sessions that ended during this time period.                                                                                                                                                                 |
| FC Session Count    | Number of Fast Connection Setup sessions that ended during this time period.                                                                                                                                                           |
| FC Session Time     | Number of milliseconds for all Fast Connection Setup sessions that ended during this time period.                                                                                                                                      |

## Bandwidth Management Statistics

Table D-7 describes the bandwidth management statistics collected per application class for each reduction tunnel.

**Table D-7 Bandwidth Management Statistics**

| Parameter       | Description                                                                                                                                                                                                                                                                          |
|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Start Time      | Start time for statistics generation.                                                                                                                                                                                                                                                |
| End Time        | End time for statistics generation.                                                                                                                                                                                                                                                  |
| Tunnel          | <p><b>Outbound bandwidth management:</b> The IP address of the destination assembler or the default allocation.</p> <p><b>Inbound bandwidth management:</b> The parameter is Inbound.</p>                                                                                            |
| Class           | <p><b>Outbound bandwidth management:</b> The bandwidth class ID, which is a collection of applications that a user has mapped to the class.</p> <p><b>Inbound bandwidth management:</b> One of the four pre-defined classes (i.e., Reduced, Intranet, TCP or Default).</p>           |
| Bytes In        | <p><b>Outbound bandwidth management:</b> The total number of application bytes into the Peribit device.</p> <p><b>Inbound bandwidth management:</b> The total number of bytes into the Remote interface of the Peribit device by class.</p>                                          |
| Bytes Out       | <p><b>Outbound bandwidth management:</b> The total number of application bytes out of outbound bandwidth management.</p> <p><b>Inbound bandwidth management:</b> the total number of bytes out of inbound bandwidth management.</p>                                                  |
| Bytes Dropped   | <p><b>Outbound bandwidth management:</b> The total number of application bytes dropped by the bandwidth management feature.</p> <p><b>Inbound bandwidth management:</b> The total number of bytes dropped by the bandwidth management feature.</p>                                   |
| Packets In      | <p><b>Outbound bandwidth management:</b> The total number of application packets into the Peribit device.</p> <p><b>inbound bandwidth management:</b> The total number of packets passed into the device by inbound bandwidth management.</p>                                        |
| Packets Out     | <p><b>Outbound bandwidth management:</b> The total number of application packets transmitted by the device. (The total number does not include meta packetization.)</p> <p><b>Inbound bandwidth management:</b> The total number of packets out of inbound bandwidth management.</p> |
| Packets Dropped | <p><b>Outbound bandwidth management:</b> The total number of application packets dropped by the bandwidth management feature.</p> <p><b>Inbound bandwidth management:</b> The total number of packets dropped by the bandwidth management feature.</p>                               |

## Inbound Traffic By Port Statistics

Table D-8 describes the Inbound traffic by port statistics.

**Table D-8 Inbound Traffic By Port Data**

| Parameter  | Description                                                                     |
|------------|---------------------------------------------------------------------------------|
| Src Port   | Inbound data's source port number.                                              |
| Bytes In   | Number of reduced bytes from the source port for unmonitored applications.      |
| Packets In | Number of reduced packets from the source port for unmonitored applications.    |
| Dst Port   | Inbound data's destination port number.                                         |
| Bytes In   | Number of reduced bytes to the destination port for unmonitored applications.   |
| Packets In | Number of reduced packets to the destination port for unmonitored applications. |

## Appendix E Common Application Port Numbers

The following table lists common application port numbers, as listed by the Internet Assigned Numbers Authority (IANA, <http://www.iana.org/assignments/port-numbers>).

**Note:** Peribit devices reserve port numbers 3577 and 3578 for TCP and UDP data transmission.

**Table E-1 Common Application Port Numbers**

| Keyword     | Port Number | Protocol | Description                           |
|-------------|-------------|----------|---------------------------------------|
| ftp-data    | 20          | TCP/UDP  | File Transfer [Default Data]          |
| ftp         | 21          | TCP/UDP  | File Transfer [Control]               |
| ssh         | 22          | TCP/UDP  | Secure Shell Protocol                 |
| telnet      | 23          | TCP/UDP  | Telnet                                |
| smtp        | 25          | TCP/UDP  | Simple Mail Transfer                  |
| dns         | 53          | TCP/UDP  | Domain Name Server                    |
| tftp        | 69          | TCP/UDP  | Trivial File Transfer                 |
| www-http    | 80          | TCP/UDP  | World Wide Web HTTP                   |
| kerberos    | 88          | TCP/UDP  | Kerberos                              |
| pop3        | 110         | TCP/UDP  | Post Office Protocol - Version 3      |
| sunrpc      | 111         | TCP/UDP  | SUN Remote Procedure Call             |
| nntp        | 119         | TCP/UDP  | Network News Transfer Protocol        |
| netbios-ns  | 137         | TCP/UDP  | NETBIOS Name Service                  |
| netbios-dgm | 138         | TCP/UDP  | NETBIOS Datagram Service              |
| netbios-ssn | 139         | TCP/UDP  | NETBIOS Session Service               |
| imap2       | 143         | TCP/UDP  | Interim Mail Access Protocol v2       |
| snmp        | 161         | TCP/UDP  | SNMP                                  |
| snmptrap    | 162         | TCP/UDP  | SNMPTRAP                              |
| clearcase   | 371         | TCP/UDP  | Clearcase                             |
| legent-1    | 373         | TCP/UDP  | Legent Corporation                    |
| legent-2    | 374         | TCP/UDP  | Legent Corporation                    |
| ldap        | 389         | TCP/UDP  | Lightweight Directory Access Protocol |
| https       | 443         | TCP/UDP  | https MCom                            |

**Table E-1 Common Application Port Numbers (Continued)**

|            |      |         |                       |
|------------|------|---------|-----------------------|
| netnews    | 532  | TCP/UDP | readnews              |
| lotusnotes | 1352 | TCP/UDP | Lotus Notes           |
| ms-sql-s   | 1433 | TCP/UDP | Microsoft-SQL-Server  |
| ms-sql-m   | 1434 | TCP/UDP | Microsoft-SQL-Monitor |
| watcom-sql | 1498 | TCP/UDP | Watcom-SQL            |
| orasrv     | 1525 | TCP/UDP | Oracle                |
| ccmail     | 3264 | TCP/UDP | cc:mail/lotus         |

## Appendix F Peribit Profile Mode

---

The following topics describe how to configure and use a Peribit device in Peribit Profile Mode™ (PPM):

- [“About Peribit Profile Mode” in the next section](#)
- [“Pre-Installation Tasks” on page 361](#)
- [“Installing an SR-15, SR-20, or SM-250 in Profile Mode” on page 362](#)
- [“Installing an SR-5x, SR-80, SR-100, or SM-500 in Profile Mode” on page 365](#)
- [“Configuring Profile Mode through the Web Console” on page 367](#)
- [“Viewing Performance Reports” on page 372](#)
- [“Exporting Performance Data” on page 374](#)
- [“Converting from Profile Mode to Inline Mode” on page 375](#)

### About Peribit Profile Mode

Peribit Profile Mode is a passive mode of operation that lets you quickly baseline a Peribit device’s effectiveness on WAN traffic reduction in your network. Profile Mode also provides an estimate of the average acceleration gains that are possible for your TCP applications. In Profile Mode, the Peribit device processes the observed data on a mirrored port, and has no effect on the actual network traffic. This lets you see the value of the Peribit device before you commit the device to your network. The Peribit device can be configured and installed in about five minutes.

#### Purpose and Benefits

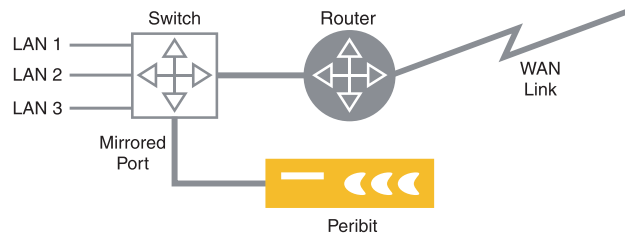
Peribit Profile Mode enables network managers to identify the reduction rates of their IP traffic by using a single Peribit device connected to a mirrored port on your network. The statistics from Profile Mode operation are presented in an easy to understand Web-based graphical format.

The benefits of Peribit Profile Mode include:

- A quick and simple method to evaluate the Peribit device (five-minute setup).
- A risk-free experience to the ease of administration and manageability of the Peribit device.
- A measurement of the effectiveness of data reduction in your own network environment, including an ROI analysis.
- A confirmation the device's ability to learn and operate transparently in your network.

## Sample Topology

The Peribit device is connected to a switch with a 10/100 Ethernet interface (SR-15, SR-20, SR-50, and SM-250) or 10/100/1000 Ethernet Interface (SR-55, SR-80, SR-100, and SM-500). The switch must be able to mirror traffic destined to the edge router, a common feature found in most switches. The Peribit device can be connected to any subnet that can see all traffic destined to/from the WAN at a specific edge/core location.



**Figure F-1 Sample Topology of a Peribit Device in Profile Mode**

In Profile Mode, the Peribit device observes all traffic that passes through the device and generates real-time reports on the potential reducible data.

## Security

Security is a top concern for all networking equipment within your network. Peribit devices in Profile Mode operate as follows:

- No packets are collected, only the potential data reduction is measured.
- No hard-disk or persistent storage of network data on the device.
- Secure CLI access using SSH, therefore no clear text passwords
- Secure Web access using SSL
- Secure ACL (Access Control Lists)
- MD5 Authentication

## Peribit's Return on Investment

Using your Peribit Profile Mode statistics along with your WAN cost structure, your Peribit sales team will work with you to generate an accurate, real, and defensible return on investment (ROI).



## Pre-Installation Tasks

Before you install the Peribit device in Profile Mode, complete the following pre-installation tasks.

1. Identify interesting WAN links, which may include one or more of the following:
  - Heavily loaded links
  - Very expensive links
  - Links to locations targeted for growth
  - Links targeted for cost cutbacks, consolidation, or reduction
2. Identify a suitable aggregation device (typically a switch) to connect the Peribit device in Profile Mode.
3. Reserve an IP address, and identify the subnet mask and default gateway for the Peribit device. The default gateway is the next hop on the WAN side of the Peribit device.
4. Set up the Ethernet mirror port (with Cisco switches use SPAN or PORT MONITOR) and check the port statistics to verify that traffic is being mirrored to this port.

---

**NOTE:** The Peribit device's Ethernet interfaces are auto-sensing.

---

After you have identified and set up a mirrored port, continue to one of the following sections depending on the type of Peribit device you have:

- [“Installing an SR-15, SR-20, or SM-250 in Profile Mode” in the next section](#)
- [“Installing an SR-5x, SR-80, SR-100, or SM-500 in Profile Mode” on page 365.](#)

## Installing an SR-15, SR-20, or SM-250 in Profile Mode

---

**NOTE:** The SR-15 is limited to WAN link speeds of 1 Mbps, while the SR-20 and SM-250 support WAN speeds of 2 Mbps. If your WAN link speed exceeds 2 Mbps, you must use an SR-50, SR-55, SR-80, SR-100, or SM-500.

---

### Hardware Installation

After you have completed the pre-installation tasks, you are ready to install the Peribit device to a mirrored port in your network.

To install the Peribit device to a mirrored port in your network:

1. Set up the chassis.
  - To install the Peribit device in a 19-inch device rack, install the supplied brackets (front panel forward) to the sides of the device with the countersunk screws provided in the kit. Next, install the chassis in your network device rack.
  - To install the SR-15 on a desktop, place the chassis on a desktop or on top of another device so that all four rubber feet are securely mounted to the flat surface. To install the SR-20 or SM-250 on a desktop, you must first install the supplied rubber feet in the marked areas on the bottom of the chassis.
2. Connect the network cables to the Peribit device.

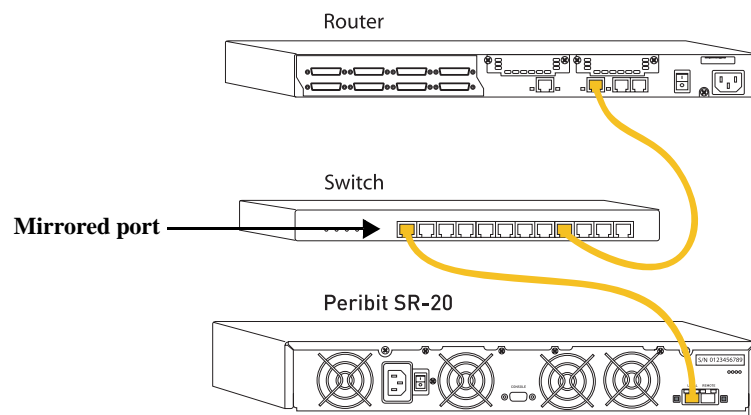
---

**IMPORTANT:** Do not connect power to the device until Step 3.

---

The SR-15, SR-20, and SM-250 have two 10/100 BaseT auto-sensing Ethernet interfaces. These RJ-45 ports are labeled REMOTE and LOCAL on the back of the chassis.

Using an Ethernet cable, connect a mirrored port on the aggregation device (such as a switch) to the LOCAL port of the Peribit device.



**Figure F-2** Connecting the SR-20 to a Mirrored Port

3. Connect the supplied power cord to the back of the chassis, and then connect the power cord to the local power source. Next, turn on the power switch
4. Proceed to the next section to configure the network settings.

## Configuring Network Settings

After you have installed and powered on the Peribit device, the next step is to configure network settings for the device.

To configure the network settings for the SR-15, SR-20, or SM-250, connect an ANSI compatible terminal to the device's serial port and use a terminal emulation program, such as TeraTerm or HyperTerminal.

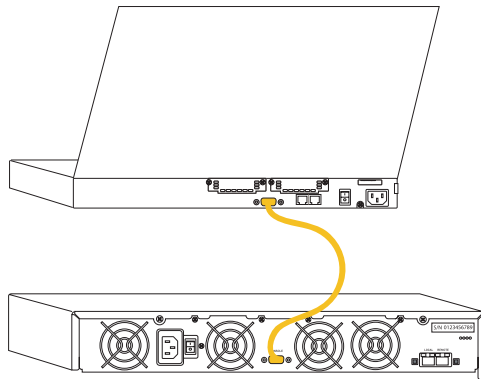
---

**NOTE:** The serial port is of type RS-232 (AT-compatible) with a male, DB-9 connector. You should use a female/female DB-9 crossover cable (null-modem cable) when connecting directly to a PC serial port.

---

To set IP parameters for the device using a terminal emulation program:

1. Connect an ANSI compatible terminal to the serial port on the back of the Peribit device (Figure 6-3).



**Figure 6-3 Connecting the SR-20 to an ANSI Compatible Terminal**

2. Verify the serial port settings are as follows:
  - Baud rate: 9600 bps
  - Data bits: 8
  - Parity: none
  - Stop bits: 1
  - Flow control: none
  - Smooth-scroll: disabled
3. Start the terminal emulation program (such as HyperTerminal), and choose to connect via the serial port.
4. Type **admin** for the user name and **peribit** for the password (you may have to press **Enter** to see the first prompt).

---

**NOTE:** This is a factory-configured password for the device. You will be asked to change the default password during the Quick Setup.

---

You will now configure the IP parameters (IP address, subnet mask, and default gateway) to enable connectivity for this device. Once these parameters are configured, you can run the Quick Setup process through the Web console.

After running the Quick Setup process, additional management tasks can be performed via the Command Line Interface (CLI) or Web console.

5. To set the IP address, IP subnet mask, and default gateway:
  - a. Type an IP address, and then press **Enter**.
  - b. Type the subnet mask for the network, and then press **Enter**.
  - c. Type the default gateway for this device, and then press **Enter**.

---

**NOTE:** The default gateway is typically the next hop on the WAN side of the Peribit device.

---

6. The required parameters are now configured. You should now commit and save the configuration. To commit and save the configuration file with the default name and location, type the following commands:

```
commit
save-config
```

The configuration file is saved as “startup.cfg” and will be used if you reboot the device.

To save the configuration file with another name, type:

```
save-config <file name>
```

The name can be up to 8 characters. Do not include a file name extension (such as “.txt”).

7. On the back of the Peribit device, verify that the LINK LED for the LOCAL port is on. If not, toggle the MDI/MDI-X button (SR-20 and SM-250 only).
8. On the front of the SR-15, verify that the “Operational” LED is on. On the SR-20 and SM-250, verify that the “Bypass” LED is off.

You are now ready to log in to the Web console and run the Quick Setup program. Refer to [“Configuring Profile Mode through the Web Console” on page 367](#).

## Installing an SR-5x, SR-80, SR-100, or SM-500 in Profile Mode

This section describes the hardware installation and the configuration steps for setting up an SR-50, SR-55, SR-80, SR-100, or SM-500 in Profile Mode.

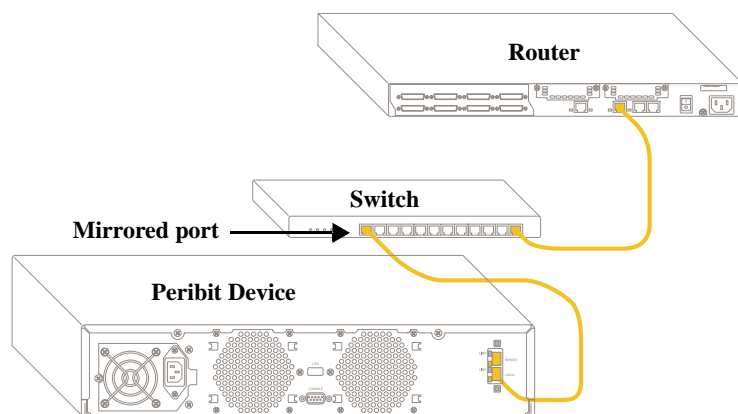
### Hardware Installation

After you complete the pre-installation tasks, connect the Peribit device to a mirrored port in your network:

1. Set up the chassis.
  - If you plan to install the Peribit device in a 19-inch device rack, install the supplied brackets (front panel forward) to the sides of the device with the countersunk screws provided in the kit. Next, install the chassis in your network device rack.
  - If you plan to install the Peribit device on a desktop, place the chassis upside down on a smooth, flat surface. Next, install the supplied rubber feet in the marked areas on the bottom of the chassis. Finally, place the chassis on a desktop or on top of another device so that all four rubber feet are securely mounted to the flat surface.
2. Connect an Ethernet cable from a mirrored port on the aggregation device (such as a switch) to the LOCAL port of the Peribit device.

**IMPORTANT:** Do not connect power to the device until Step 3.

The SR-50 is configured with two 10/100 BaseT auto-sensing Ethernet interfaces. The SR-55, SR-80, SR-100, and SM-500 are configured with two 10/100/1000 BaseT auto-sensing Ethernet interfaces. These RJ-45 ports are labeled REMOTE and LOCAL on the back of the chassis.

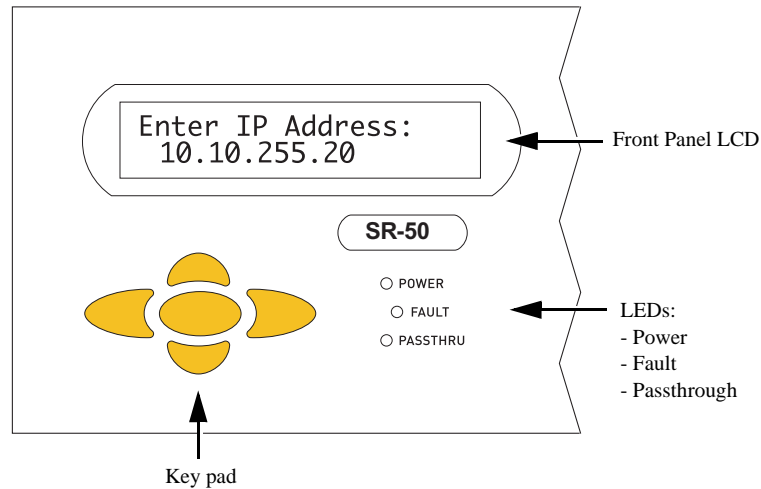


**Figure F-4** Connecting the Peribit Device to a Mirrored Port

3. Connect the power cable to the back of the chassis, and then connect the other end of the power cable to your local power source.

## Configuring Network Settings

After you install and start the Peribit device, the next step is to use the front-panel keypad and LCD to enter the network address information for the device. The LCD shown below is used for the SR-50, SR-55, and SM-500 (the SR-80/SR-100 LCD is shown in [“Configuring Network Settings for the SR-80 and SR-100” on page 40](#)).



**Figure F-5 SR-50 Front Panel Keypad and LCD**

When you start the device, the “Peribit Networks” message appears in the front panel LCD.

1. Press the **Enter** button (center button) to start.
  - a. At the “Select Setup Network\_” prompt in the LCD, press **Enter**.  
You are prompted to enter network address information for the device.
  - b. Use the front-panel keypad to assign an IP address, subnet mask, and the default gateway for the Peribit device as follows:
    - Use the up and down arrow buttons to display a number (between 0-9).
    - Use the left and right arrow buttons to move to the previous or next character.
    - Use the center button (**Enter**) to make a selection.

---

**NOTE:** The default gateway is typically the next hop on the Remote side of the Peribit device.

---

2. After entering network address and interface information, use the left arrow button to select **Save** and **Commit**, and press **Enter** to save the device configuration.
3. On the back of the device, verify that the LINK LED for the Local port is on. If not, toggle the MDI/MDI-X button (SR-50 only).
4. On the front of the device, verify the “Passthru” LED is off.

## Configuring Profile Mode through the Web Console

After assigning IP parameters to the Peribit device, you are ready to configure the device for Profile Mode operation, as described in the following sections:

- “Running Quick Setup” in the next section
- “Defining Virtual Peribit Devices in Profile Mode” on page 370
- “Excluding Traffic to the Local Subnet” on page 372

The SRS Web console supports Microsoft Internet Explorer version 5.5 and 6.0, and Netscape Communicator 7.x. Data is securely transmitted through HTTPS.

### Running Quick Setup

After starting on the Peribit device and assigning IP parameters, you are ready to run Quick Setup and configure the device for Profile Mode operation.

To run Quick Setup:

1. From a local workstation, start your web browser and enter the following URL:  
  
`https://<IP address of the Peribit device>`
2. Depending on your browser settings, the Security Alert dialog box may appear, click **Yes** to proceed.
3. In the Enter Network Password dialog box, type **admin** for the user name and **peribit** for the password. You will be asked to change the default password at the end of Quick Setup.

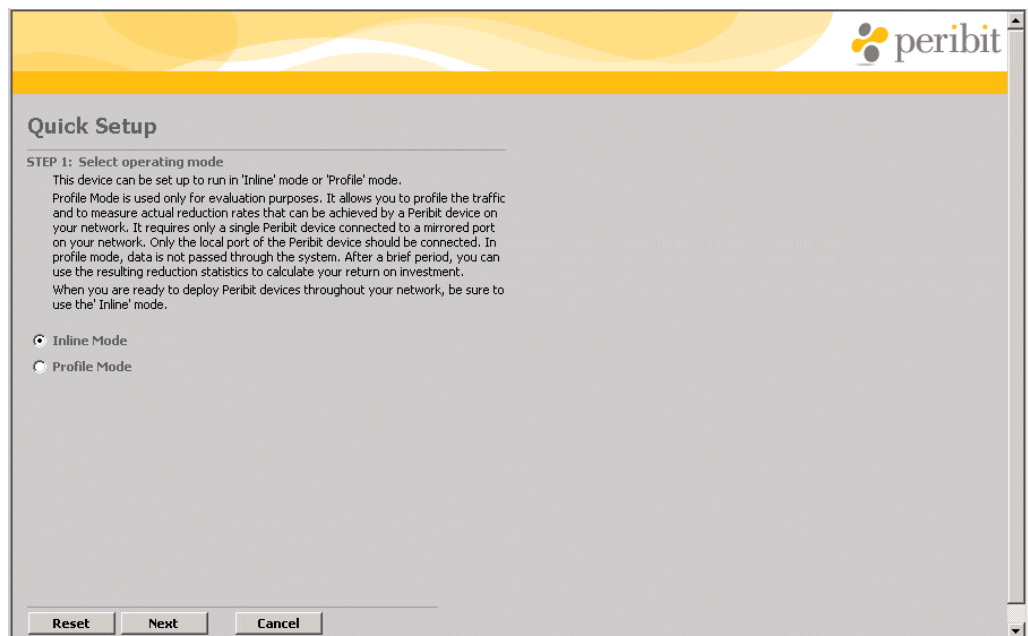


Figure F-6 Select Profile Mode

4. Select **Profile Mode** and click **Next** to continue.

**Quick Setup**

STEP 2 : Set the time

The time must be set on the Peribit device in order to display the correct time in reports. If you have access to a time (NTP) server, the Peribit device can be synchronized with it. To configure NTP server, please visit the 'Time' page under 'Setup' tab after completing Quick Setup.

Local Time: Time: 08:43 HH:MM AM PM  
Date: 9/15/2003 MM/DD/YYYY

Time Zone: (GMT-08:00) Pacific Time (US and Canada), Tijuana

Daylight Saving: ☐ Automatically adjust time for daylight saving

Back Next Cancel

**Figure F-7 Setting the Time**

If the time settings are not correct, enter the current date and time, and select the local time zone for the Peribit device. If applicable, select the **Daylight Saving** checkbox.

5. Click **Next** to continue.

**Quick Setup**

STEP 3 : Advertise local subnet

☐ Advertise 192.168.0.0/255.255.255.0 to other Peribit devices so that data destined for this subnet will be targeted for reduction.

If this option is not checked, after completing Quick Setup you should use the 'Reduction Subnets' page under the 'REDUCTION' tab to select a subnet to advertise.

You may enter a name to help you identify this device

Device name: SR-192.168.0.211 Optional

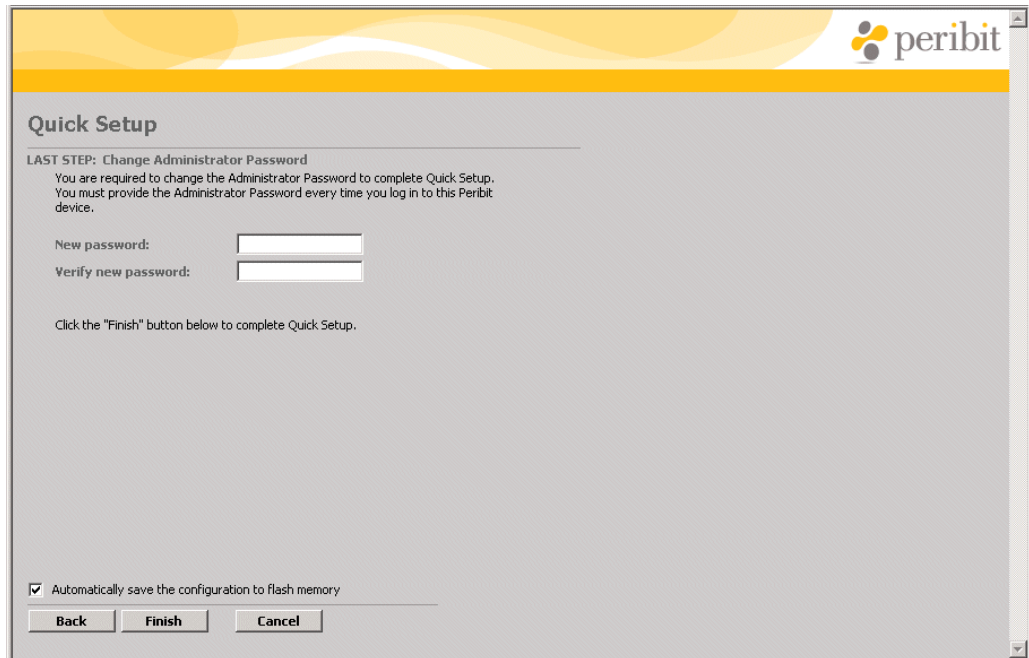
Back Next Cancel

**Figure F-8 Enter a Device Name**

Optionally, enter a unique name for the Peribit device (up to 30 characters) in the **Device name** field.



6. Click **Next** to continue.

The screenshot shows a web browser window displaying the Peribit Quick Setup interface. The top header has a yellow background with the Peribit logo on the right. The main content area is titled 'Quick Setup' and has a subtitle 'LAST STEP: Change Administrator Password'. Below this, a message states: 'You are required to change the Administrator Password to complete Quick Setup. You must provide the Administrator Password every time you log in to this Peribit device.' There are two input fields: 'New password:' and 'Verify new password:'. Below these fields, a note says 'Click the "Finish" button below to complete Quick Setup.' At the bottom, there is a checkbox labeled 'Automatically save the configuration to flash memory' which is checked. Below the checkbox are three buttons: 'Back', 'Finish', and 'Cancel'.

**Figure F-9 Changing the Administrator Password**

Enter a new Administrator password in the **New password** and **Verify new password** fields, and then click **Finish**.

---

**NOTE:** If you deselect the “automatic save” option, the configuration settings will be lost the next time you restart the device.

---

The device is now configured for Peribit Profile Mode. The next time you log in to the Web console, the top banner will indicate Profile Mode. Except for the SR-15 and SR-20, the front panel LCD also indicates Profile Mode.

## Defining Virtual Peribit Devices in Profile Mode

Profile Mode lets you see how a Peribit device performs in your network without affecting network traffic. In Profile Mode, the device passively calculates potential data reduction statistics for all traffic and for individual applications.

To view the performance for specific remote subnets, you can define “virtual” Peribit devices and associate one or more subnets with each virtual device. If you also specify a circuit speed, it is used to estimate the average acceleration gains that Flow Pipelining may achieve for each application. On the monitoring reports, you can select a virtual device from the Destination menu to view the performance for the associated subnets (refer to [“Viewing Results” on page 201](#)).

To define remote subnets in Profile Mode:

1. Install the Peribit device as described in [“Peribit Profile Mode” on page 359](#).
2. In the Setup page, click **ADVANCED** in the left-hand navigation frame, and then click **Profile Mode** (available only if the device is installed in Profile Mode).

**Peribit-SR** Profile mode

peribit

SETUP REDUCTION OOS ACCELERATION MONITOR ADMIN HELP Logged in as: admin SAVE LOGOUT

**Setup**

BASIC

- Addresses
- Interfaces
- Time
- License Key
- SNMP
- Syslog Server
- Local Routes
- Registration Server

AAA

APPLICATIONS

IPSEC

**Profile Mode**

Profile Mode allows you to measure reduction rates that can be achieved by a Peribit device on your network. It requires only a single Peribit device connected to a mirrored port on your network.

If you are deploying Peribit devices to actually perform reduction on your network, then Profile mode must be DISABLED.

Profile Mode allows you to monitor throughput statistics for specific subnets.

| Remote SR                        | Circuit speed (kbps) | Remote subnets          |
|----------------------------------|----------------------|-------------------------|
| <input type="checkbox"/> 1.2.3.4 | 1500                 | 192.168.0.0 255.255.0.0 |

New SR... Delete Checked Click on Remote SR to edit

Reset Deactivate Profile Mode

**Figure 6-10 Adding Virtual Peribit Devices in Profile Mode**

On the Profile Mode page, you can:

- Add a virtual Peribit device, as described in Step 3 to Step 5.
- Change a virtual device. Click the virtual device address, change the remote subnets or circuit speed, and click **Submit**.
- Delete a virtual device. Click the check box next to the virtual device, and click **Delete Checked**.
- Switch from Profile Mode to Inline Mode. Click **Deactivate Profile Mode** to reboot the device (the device restarts as a registration server). Verify that the Local and Remote interfaces are installed properly for live operation, as described in [“Installation” on page 27](#).

---

**NOTE:** Network data cannot pass through the device while Profile Mode is enabled.

---

3. To add a virtual Peribit device and its remote subnets, click **New SR**.

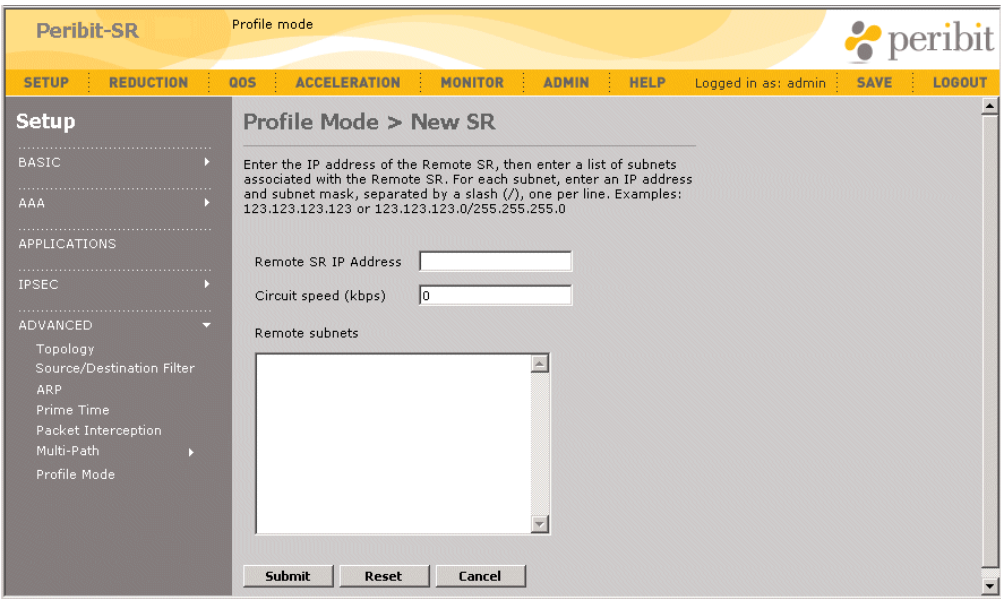


Figure 6-11 Defining Remote Subnets in Profile Mode

4. Specify the following information:

|                      |                                                                                                                                                                                                                                                                                                                                                         |
|----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Remote SR IP Address | Enter any IP address for the virtual device (it need not be a real address). You can select this address from the Destination menu on reduction reports to view the performance for the associated remote subnets.<br><br>The maximum number of virtual endpoints (up to 120) depends on the device type (2 for the SR-15, 5 for the SR-20 and SM-250). |
| Circuit speed        | Optional WAN speed used to estimate the average possible acceleration of TCP traffic to the remote subnets using Flow Pipelining.<br><br>Average Flow Pipelining gains are calculated only for virtual devices that have a circuit speed specified.                                                                                                     |
| Remote subnets       | Enter the remote subnets (one per line) associated with this virtual device. The subnet format is:<br><br><IP address>/<subnet mask>                                                                                                                                                                                                                    |

5. Click **Submit** to activate the changes, or click **Reset** to discard them.

6. To retain your changes when the device is restarted, click **SAVE** in the menu frame.

## Excluding Traffic to the Local Subnet

To improve the accuracy of the reduction statistics, exclude all traffic sent to the local subnet where the Peribit device is installed. This traffic would normally be assembled by the device and will reduce the average reduction percentages if it is not excluded.

1. In the Setup page, click **ADVANCED** in the left-hand navigation frame, and then click **Source/Destination Filter**.
2. Select **DO NOT reduce data between the following source/destination pairs**.
3. Enter an asterisk (\*) in the **Source** field and the local subnet and mask in the **Destination** field. Do NOT select the **Bidirectional** check box.

You can define additional source/destination filters as needed (refer to [“Filtering Data Reduction by Source and Destination”](#) on page 100).

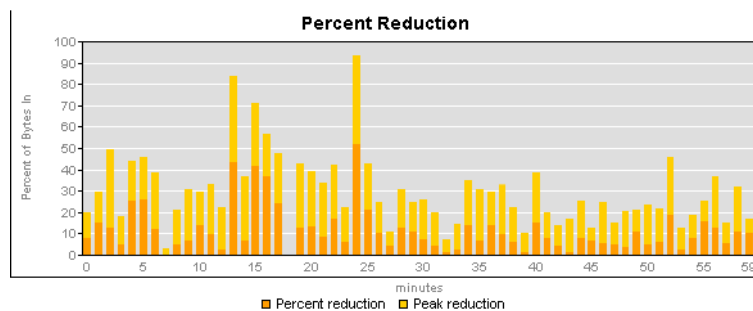
4. To retain your changes when the device is restarted, click **SAVE** in the menu frame.

To further customize performance in Profile Mode, you can enable or disable data reduction for specific applications (refer to [“Reducing and Monitoring Applications”](#) on page 130).

## Viewing Performance Reports

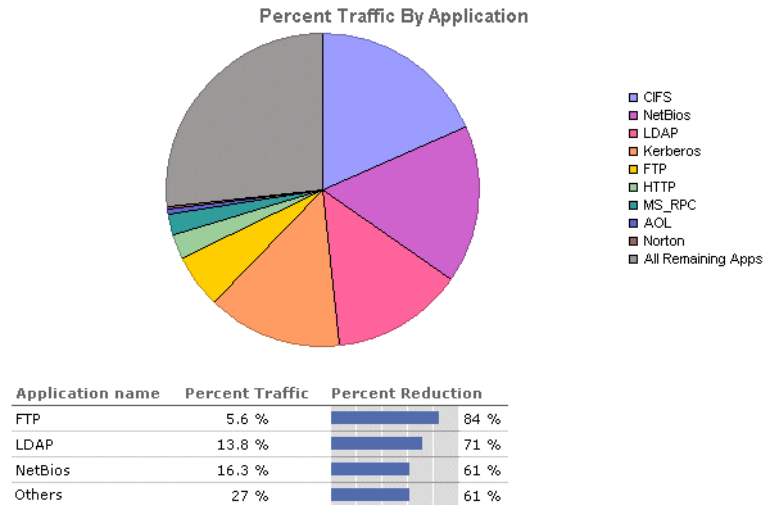
After installing the Peribit device in Profile Mode, you can use the Monitor pages of the SRS Web console to view potential reduction and performance statistics:

- Data Reduction statistics show the potential data reduction for all traffic that traverses the Peribit device.



- Application Summary statistics include a pie chart of the nine monitored applications that have the highest percentage of the total traffic into the reduction engine. The accompanying table shows the traffic statistics and the estimated percentage of data reduction for each monitored application.

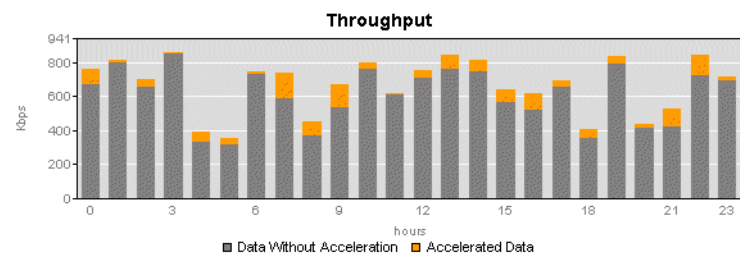
The **All Remaining Apps** category in the chart shows the traffic for all other applications (both defined and undefined). The **Others** category in the table is for reduced applications that are undefined or unmonitored.



- The Flow Pipelining/AFP statistics show an estimate of the average acceleration factor and increased throughput that Flow Pipelining (not AFP) may achieve for each application's eligible sessions. Sessions whose TCP receive window is less than 64 KB are eligible for acceleration (network congestion may limit the receive window to less than 64 KB). Note that these statistics are calculated only for virtual devices that have a circuit speed specified.

#### Flow Pipelining/AFP: Today

Start Time: 1/12/04 12:00 AM Application: all Destination: all



| Application | Total TCP Sessions (count) | Accelerated Sessions (count) | Traffic (MB) | Average Session Throughput (Mbps) |             | Estimated Acceleration Factor |
|-------------|----------------------------|------------------------------|--------------|-----------------------------------|-------------|-------------------------------|
|             |                            |                              |              | Actual                            | w/o Accel.* |                               |
| FTP         | 56                         | 56                           | 369          | 123                               | 61          | 2.1 X                         |
| HTTPS       | 18                         | 18                           | 54           | 16                                | 11          | 1.5 X                         |
| ICMP        | 42                         | 42                           | 129          | 153                               | 71          | 2.3 X                         |
| Others      | 17495                      | 17495                        | 76           | 8                                 | 5           | 1.7 X                         |
| CIFS        | 12                         | 12                           | 1235         | 76                                | 24          | 3.1 X                         |
| HTTP        | 78                         | 78                           | 698          | 28                                | 7           | 4.2 X                         |

**NOTE:** The **w/ Accel.** column indicates the estimated average throughput that may be achieved for accelerated sessions if Flow Pipelining is enabled for the application in Inline Mode. Actual inline results may differ from this estimate and are subject to external factors, such as server load. Applications that have the highest **Acceleration Factor** are the best candidates for Flow Pipelining when you move to Inline Mode.

- Fast Connection Setup statistics show an estimate of the average reduction in session time that Fast Connection Setup may achieve for each application's "short" sessions. Short sessions are those that last less than ten times the round-trip time (RTT). If a specific application traffic flow has five consecutive short sessions, subsequent identical traffic flows will be accelerated.

### Fast Connection Setup: Today

Start Time: 00:00 AM 01/13/2004 Application: all Destination: all

| Application | Total TCP Sessions (count) | Short Sessions* |           | Average Short Session Time (msec) |            | Average Short Session Acceleration (percent) |  |  |  |  |
|-------------|----------------------------|-----------------|-----------|-----------------------------------|------------|----------------------------------------------|--|--|--|--|
|             |                            | (count)         | (percent) | with Accel.                       | w/o Accel. |                                              |  |  |  |  |
| CIFS        | 0                          | 0               | 0.0%      | 0.00                              | 0.00       | 0.0%                                         |  |  |  |  |
| FTP         | 714                        | 68              | 9.5%      | 873.91                            | 1088.90    | 19.7%                                        |  |  |  |  |
| HTTP        | 329                        | 121             | 36.8%     | 772.30                            | 1020.51    | 24.3%                                        |  |  |  |  |
| ICA         | 1                          | 0               | 0.0%      | 0.00                              | 0.00       | 0.0%                                         |  |  |  |  |
| Lotus Notes | 0                          | 0               | 0.0%      | 0.00                              | 0.00       | 0.0%                                         |  |  |  |  |
| Mail        | 0                          | 0               | 0.0%      | 0.00                              | 0.00       | 0.0%                                         |  |  |  |  |
| NetBios     | 0                          | 0               | 0.0%      | 0.00                              | 0.00       | 0.0%                                         |  |  |  |  |
| Oracle      | 1                          | 0               | 0.0%      | 0.00                              | 0.00       | 0.0%                                         |  |  |  |  |
| SQL Server  | 1                          | 0               | 0.0%      | 0.00                              | 0.00       | 0.0%                                         |  |  |  |  |
| Sybase      | 1                          | 0               | 0.0%      | 0.00                              | 0.00       | 0.0%                                         |  |  |  |  |
| Telnet      | 0                          | 0               | 0.0%      | 0.00                              | 0.00       | 0.0%                                         |  |  |  |  |

\* 'Short Sessions' are defined as sessions with duration less than 10 times the Round Trip Time

- Outbound QoS statistics can be viewed by configuring the Peribit device as its own "endpoint," which simulates an environment where all outbound traffic is sent to the same remote device. Note that the "Other traffic" endpoint is not used, and "virtual" devices cannot be used as endpoints for outbound QoS. For more information about outbound QoS, refer to ["Configuring Outbound QoS Policies" on page 153](#).
- Inbound QoS is not applicable in Profile Mode.

For more information on viewing performance results, refer to ["Viewing Results" on page 201](#).

## Exporting Performance Data

While in Peribit Profile Mode, you can export performance data to a file in comma-separated variable (CSV) format. The exported data is similar to the data displayed in the Monitor page of the SRS Web console. The CSV file can then be sent to your Peribit or Reseller representative, or imported into a spreadsheet application (such as Microsoft Excel) or other data evaluation program.

To export data to CSV format:

- In the SRS Web console, click **ADMIN** in the menu frame, click **TOOLS** in the left-hand navigation frame, and then click **Export Data**.
- In the Export Data page, select **All (ZIP)** to export the data for all time periods as a ".zip" file. If you cannot open a ".zip" file (some browser versions cannot), select **All (CSV)**.
- Click **Submit**, and then click **Save** and specify a file name and location.

## Converting from Profile Mode to Inline Mode

To switch from Profile Mode to Inline Mode (live operation):

1. Verify that the Local and Remote interfaces are installed properly for live operation, as described in [“Installation” on page 27](#).
2. In the Setup page, click **ADVANCED** in the left-hand navigation frame, and then click **Profile Mode** (available only if the device is installed in Profile Mode).
3. Click **Deactivate Profile Mode**. The device restarts as a registration server and the Remote interface is activated.
4. Click **Registration Server** in the Setup page, click **Transfer registration server designation to another device**, specify the IP address of your current registration server, and click **Submit**.
5. Click **Registration Server** in the Setup page, enter the password of the registration server, and click **Submit**. For more information about the registration server, refer to [“Configuring Registration Servers and Communities” on page 76](#).

Note that to switch back to Profile Mode from Inline Mode, you must disconnect the Remote interface, reconnect the Local interface to a mirrored port, load the factory default settings, and then enter the network information and run Quick Setup again.





# Glossary

---

|                                        |                                                                                                                                                                                                                |
|----------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>access control list</b>             | List of IP addresses from which an administrator can login to a Peribit device.                                                                                                                                |
| <b>assembly</b>                        | Process by which a Peribit device re-assembles reduced traffic into its original form.                                                                                                                         |
| <b>auto-negotiation</b>                | A protocol that enables Ethernet systems at the end of a twisted-pair or optical fiber segment to negotiate configuration parameters such as speed, half or full-duplex mode, and use of flow control.         |
| <b>bandwidth</b>                       | The amount of data that can be sent through a network connection, measured in bits per second (bps).                                                                                                           |
| <b>bridge</b>                          | A device that partitions a network into separate segments. The bridge allows a packet to be transmitted from one segment to the other only if it is addressed to a host on the other segment.                  |
| <b>CLI</b>                             | See <i>command line interface</i> .                                                                                                                                                                            |
| <b>command line interface (CLI)</b>    | A method of configuring the Peribit device by typing in commands via the local serial interface or remote SSH session.                                                                                         |
| <b>endpoint</b>                        | Peribit device. When you install a Peribit device in your network, the device's auto-discovery function locates all other devices in the Peribit community and exchanges network information with each device. |
| <b>filter</b>                          | Operator defined IP addresses or TCP port numbers that determine valid addresses or applications for reduction processing. A single filter or a list of filters can be defined for each system.                |
| <b>full-duplex</b>                     | A mode of operation that enables a pair of systems connected by a link to transmit frames to one another at the same time.                                                                                     |
| <b>gateway</b>                         | A device that connects and forwards packets between computers or different networks. See also, <i>router</i> .                                                                                                 |
| <b>half-duplex</b>                     | A mode of operation that allows only a single station to successfully transmit a frame at a given time.                                                                                                        |
| <b>hardware passthrough</b>            | Hardware-driven process by which all traffic is passed through the Peribit device at wire-speed. It is invoked automatically upon disruption.                                                                  |
| <b>HTTP</b>                            | Hyper Text Transfer Protocol. The protocol most often used to transfer information from World Wide Web servers to browsers.                                                                                    |
| <b>ICMP</b>                            | Internet Control Message Protocol. An Internet Protocol used to communicate between devices on a network to manage errors and generate control messages.                                                       |
| <b>Interior Gateway Protocol (IGP)</b> | A group of protocols that provide routing information to the routers within an autonomous network.                                                                                                             |
| <b>Internet Protocol (IP)</b>          | The protocol that is used to route a data packet from its source to its destination over the Internet.                                                                                                         |
| <b>IP address</b>                      | A numeric address, such as 10.10.187.22, assigned to every device on the network.                                                                                                                              |
| <b>IP subnet mask</b>                  | A numeric address, such as 255.255.0.0, used to define an IP subnet or to determine membership of an IP address in an IP subnet.                                                                               |

|                            |                                                                                                                                                                                                                                                                       |
|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>IP subnet</b>           | A group of IP addresses defined by the IP address and IP subnet mask pair, such as 10.10.0.0/255.255.0.0.                                                                                                                                                             |
| <b>latency</b>             | The time necessary for a packet of data to travel from a source to a destination across a network.                                                                                                                                                                    |
| <b>LCD</b>                 | The Sequence Reducer front panel display that can serve as the initial user interface for a local operator (SR-50, SR-55, and SR-80 only).                                                                                                                            |
| <b>local port</b>          | Ethernet port on the back of the Peribit device. Use to connect to a LAN aggregating switch. <i>See also, remote port.</i>                                                                                                                                            |
| <b>log</b>                 | A record of device activity. Logs are recorded for system information, performance, backup, and recovery.                                                                                                                                                             |
| <b>MIB</b>                 | Management Information Base. A database containing ongoing configuration information and statistics of a device in a network. MIBs are used with SNMP.                                                                                                                |
| <b>MTU</b>                 | Maximum Transmission Unit. The largest size packet that can be transmitted by a device on a network.                                                                                                                                                                  |
| <b>netmap</b>              | Reduction subnets advertised by each Peribit device. Each Peribit device dynamically adjusts its advertised subnets to exclude unreachable addresses. In this case, multiple remote routes are advertised for the same subnet to exclude unresponsive addresses.      |
| <b>operator interface</b>  | The front-panel keypad and LCD, a local terminal via the serial interface, a remote terminal via the web console, or a remote terminal via the ssh.                                                                                                                   |
| <b>OSPF</b>                | Open Shortest Path First. An interior gateway protocol that routes messages according to the least expensive path.                                                                                                                                                    |
| <b>packet</b>              | A unit of data formatted for transmission on a network. Data is broken down into packets for sending over a packet switched network. Each packet has a header containing its source, destination, other control information, and a payload of data to be transmitted. |
| <b>passthrough mode</b>    | A function of the Peribit device where data passes through at wire-speed upon device disruption or overflow.                                                                                                                                                          |
| <b>Peribit community</b>   | Two or more Peribit devices that can reduce and assemble data for each other. Initially, all Peribit devices belong to the Default community. Each Peribit device contacts the registration server to identify the other devices in the same community.               |
| <b>ping</b>                | A program used to test whether a particular network destination is online, by sending an Internet control message protocol (ICMP) echo request and waiting for a response.                                                                                            |
| <b>reduction rate</b>      | The rate of data reduction in percentage of a Peribit device.                                                                                                                                                                                                         |
| <b>reduction subnets</b>   | The subnets for which a Peribit device can assemble reduced data. Each Peribit device advertises its reduction subnets to the other devices in the Peribit community.                                                                                                 |
| <b>registration server</b> | The Peribit device that stores the network information for the Peribit devices in each community. Each device periodically contacts the registration server to identify the other devices in the same community.                                                      |
| <b>remote port</b>         | Ethernet port on the back of the Peribit device. Used to connect to WAN router Ethernet port. <i>See also, local port.</i>                                                                                                                                            |
| <b>response time</b>       | The time it takes for a host to respond to a user command.                                                                                                                                                                                                            |
| <b>RIP</b>                 | <i>See Routing Information Protocol.</i>                                                                                                                                                                                                                              |

|                                                  |                                                                                                                                                                                                                                                                                                                             |
|--------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>round-trip time (RTT)</b>                     | The time it takes to send a packet to a remote host and receive a response; used to measure delay on a network at a given time.                                                                                                                                                                                             |
| <b>router</b>                                    | Specialized computer that forwards data packets between networks. Routers can exchange information about their network connectivity (or accessibility) with neighboring network routers using standard routing protocols. This information is used by the router to determine an optimal path for a packet being forwarded. |
| <b>Routing Information Protocol (RIP)</b>        | An interior gateway protocol used in IP networks.                                                                                                                                                                                                                                                                           |
| <b>Secure Shell</b>                              | A program used for secure remote login to a Peribit device.                                                                                                                                                                                                                                                                 |
| <b>Simple Network Management Protocol (SNMP)</b> | The Internet standard protocol for network management software.                                                                                                                                                                                                                                                             |
| <b>Simple Network Time Protocol (SNTP)</b>       | A protocol that can synchronize clocks on local computers with time clocks on the Internet.                                                                                                                                                                                                                                 |
| <b>software passthrough</b>                      | Software-driven process by which a Peribit device transparently passes packets through the system in lieu of processing (reducing).                                                                                                                                                                                         |
| <b>SSH</b>                                       | <i>see Secure Shell.</i>                                                                                                                                                                                                                                                                                                    |
| <b>static IP address</b>                         | A permanent IP address for a client, server, or other network device.                                                                                                                                                                                                                                                       |
| <b>Switch</b>                                    | A networking device that sends packets directly to a port associated with a given network address.                                                                                                                                                                                                                          |
| <b>TCP</b>                                       | Transmission Control Protocol. The most common Internet transport layer protocol, defined in RFC 793. TCP is connection-oriented and stream-oriented, and provides for reliable communication over packet-switched networks.                                                                                                |
| <b>tunneling</b>                                 | Encapsulating one type of packet inside the data field of another packet.                                                                                                                                                                                                                                                   |
| <b>User Datagram Protocol (UDP)</b>              | User Datagram Protocol. UDP is connectionless and does not guarantee reliable communication; the application itself must process any errors and check for reliable delivery. Defined in RFC 768.                                                                                                                            |
| <b>warm reboot</b>                               | A reboot of the Peribit device without powering off the unit.                                                                                                                                                                                                                                                               |
| <b>Web Console</b>                               | A method for configuring and monitoring the statistics of the Peribit device using a Web browser.                                                                                                                                                                                                                           |



# Index

---

## Numerics

3DES encryption for IPsec 193, 198, 274  
802.1q VLAN support 62, 272

## A

AAA settings 80, 260  
acceleration, packet flow  
    active flow pipelining 184, 188, 262  
    fast connection setup 184, 187, 262  
    flow pipelining 184, 186, 262  
    forward error correction 184, 262  
    reports 217  
access control lists 309  
access control log file 241, 258  
active flow pipelining  
    configuring 184, 188, 262  
    report 217  
advertising reduction subnets 126, 301  
AES encryption for IPsec 193, 198, 274  
aggregate WAN speed  
    about 149  
    defining inbound QoS 174, 286  
    defining outbound QoS 155, 166, 288  
applications  
    accelerating  
        active flow pipelining 188, 264  
        fast connection setup 187, 264  
        flow pipelining 186, 264  
    common port numbers 357  
    defining  
        from top traffic 222  
        manually 90, 265  
    defining gateways for 300  
    monitoring 130, 277  
    reducing 130, 270  
    summary statistics 207  
    visibility in tunnels 138, 298  
ARP, configuring 102, 267  
assemblers  
    default 135, 297  
    preferred 137, 297  
authentication methods, selecting 81, 260  
automatic installation 28

## B

backup devices, configuring 268  
bandwidth management  
    inbound 173, 285  
    outbound, see "outbound QoS"

baud rate  
    default 31  
    setting 269  
BGP routes, polling from a router 308  
boot images  
    activating 234, 254  
    loading 231, 257  
browser support 48  
buttons  
    Bypass/Disable 33, 42  
    front panel 36, 40, 47, 319, 366  
    MDI/MDI-X 32, 37, 48  
bypass condition, multi-path 118, 279  
Bypass/Disable button 33, 42  
bytes graph 206

## C

carving out unreachable addresses  
    and outbound QoS 153  
    enable/disable 302  
chassis, setup 317  
circuit speeds  
    and router overhead 148  
    configuring 156, 167, 289  
Citrix names, in application definitions 94  
classes, traffic  
    inbound 173, 285  
    outbound 157, 163, 288  
CLI commands  
    about  
        basics of using 247  
        command modes 248  
        entering commands  
            from a file 256  
            from a terminal or SSH program 245  
            from the Web console 239  
configuration 259  
    aaa 260  
    acceleration 262  
    application 265  
    arp 267  
    backup 268  
    clock 269  
    console 269  
    filter 270  
    interface 271  
    ip 273  
    ipsec 273  
    license 276

- mon-apps 277
- multi-node 321
- multi-path 278
- ospf 281
- packet-interception 282
- prime-time 284
- profile-mode 284
- qos inbound 285
- qos outbound 287
- radius 292
- reduction 293
- reduction-subnet 301
- reg-server 303
- remote-routes 304
- rip 305
- route 306
- route-poll 308
- security 309
- snmp 310
- sntp 311
- stack-group 311
- syslog 312
- top-talker 313
- file management
  - copy 258
  - list 259
  - remove 259
- show 248
- top level 250
  - commit 250
  - import-route-table 251
  - load-config 251
  - packet-capture 252
  - ping 253
  - reboot 254
  - rollback 255
  - save-config 255
  - set 256
  - shutdown 256
  - source 256
  - support 257
  - traceroute 257
  - upgrade 257
- client devices
  - client-mode command 311
  - disconnecting 44
- client devuces
  - connecting 43
- CMS
  - about 25
  - automatic installation 28
  - exclusive access to Peribit devices 309
- command modes 248
- communities, defining 76, 303
- community topology 97, 293
- configuration file
  - displaying 229, 255
  - loading 230, 251
  - saving 227, 255
  - setting to the factory default 232, 251
- congestion control 168, 289
- connect timeout, registration server 303
- console port
  - baud rate, setting 269
  - default settings 31, 246
- copying files 258
- CSV, interpreting results 349

## D

- data packets, forward error correction 184, 263
- data reduction statistics
  - bytes graph 206
  - peak data reduction 205
  - percentage formula 204
  - viewing 204
- dead interval, OSPF 281
- dead-time interval, RADIUS 85, 292
- dedicated WANs 149
- default assemblers 135, 297
- default gateway, configuring
  - in CMS 28
  - in front panel 36, 40, 47, 319, 366
  - in Web/CLI 59, 273
- default IPsec policy 273
- Default traffic class
  - inbound QoS 173, 285
  - outbound QoS 163, 288
- default user name and password 31
- deployment, examples 16
- device configuration
  - displaying 229, 255
  - loading 230, 251
  - saving 227, 255
  - setting to the factory default 232, 251
- device names 60, 256
- diagnostic files, generating 243, 257
- disk icons 128
- diversion settings, multi-path 280
- downgrading to a previous release 231, 255
- DSCP values, see "ToS/DSCP values"
- dynamic resource allocation (DRA), configuring 299
- dynamic routes
  - importing from a file 72, 251
  - polling from a router 71, 308
  - using OSPF 70, 281
  - using RIP 70, 305

## E

- encryption, see "IPSec"
- endpoints
  - IPSec 192, 275
  - multi-path 119, 280
  - NSM 128, 296
  - outbound QoS 166, 289
  - packet flow acceleration 182, 263
  - reduction 123, 295
  - summary report 224
- erasing the disks 233, 252
- Ethernet ports, connecting the cables 29, 34, 39, 45, 317
- exporting data
  - interpreting results 349
  - packet capture 237, 252
  - through the Web console 242
  - top traffic 222
- external routing for packet interception 105, 282

## F

- factory default configuration 232, 251
- fast connection setup
  - configuring 184, 187, 262
  - report 219
- filters, reduction
  - configuring application 130, 270
  - source/destination 100, 270
- flow pipelining
  - configuring 184, 186, 262
  - report 217
- forward error correction
  - configuring 184, 262
  - report 221
- fragments, reducing 271
- front panel
  - securing 88, 309
  - using the buttons 36, 40, 47, 319, 366

## FTP

- for NSM pre-sync 141

## G

- gateways, configuring
  - application 300
  - default
    - in CMS 28
    - in front panel 36, 40, 47, 319, 366
    - in Web/CLI 59, 273
  - in multi-path configurations 116, 279
- guaranteed bandwidths
  - configuring 158, 165, 288
  - overriding 162

## H

- hardware passthrough 33, 42
- heartbeat packets
  - for all reduction tunnels 298
  - for high-loss tunnels 265
- hello interval, OSPF 281
- high-availability support 60
- HMAC/SHA-1 authentication for IPsec 193, 198, 275

## I

- IANA port map 223, 277
- ICMP redirect age-out setting 306
- icons
  - disk 128
  - endpoint and tunnel 125
  - IPsec status 196
  - Multi-Path status 120
  - on EndPoints Summary report 224
- idle user timeout 86, 260
- importing routes
  - by polling a router 71, 308
  - from a file 72, 251
- inbound QoS
  - configuring 173, 285
  - report 215
- inline deployment 28
- installation
  - automatic 28
  - inline and off-path 28
  - post-install tasks 56
  - pre-install tasks 27, 316
  - SM-500 45
  - SR-15, SR-20, and SM-250 29
  - SR-50 and SR-55 34
  - SR-80 and SR-100 38
- interface
  - link failure propagation 61, 271
  - manual mode test 61, 272
  - periodic mode test 272
  - settings, configuring
    - in front panel 36, 41, 47
    - in Web/CLI 60, 271
  - statistics 271
- Intranet traffic class 173, 285
- IP address, configuring
  - in CMS 28
  - in front panel 36, 40, 47, 319, 366
  - in Web/CLI 59, 273
  - secondary address, multi-path 116, 278
- IP compression, meta-packet 298

## IPSec

- configuration procedure 190, 273
- defining endpoints 192, 275
- defining templates 197, 274
- using the Setup Wizard 191

## K

### keep-alive packets

- for all reduction tunnels 298
- for high-loss tunnels 265

### key lifetimes 198, 274

### keyboard shortcuts, CLI 247

### keys

- RADIUS 85, 292

## L

### LAN-WAN routing check 299

### latency threshold, multi-path 120, 280

### Layer 2 multicast traffic 210

### LEDs, checking 37, 42, 48

- SR-15, SR-20, and SM-250 32

### license key, entering 64, 276

### lifetimes, IPSec key 198, 274

### link failure propagation 61, 271

### load balancing

- across Peribit devices 133, 297
- across routers
  - route-based 74, 306
  - router-based using ToS 307

### loading a boot image 231, 257

### local routes

- about 67
- adding static 69, 306
- from OSPF 70, 281
- from RIP 70, 305
- importing from a file 72, 251
- polling from a router 71, 308

### local users, defining 85, 260

### log files

- access control 241, 258
- system 240, 258

### logging in

- CLI 246
- Web console 57

### login retries, SSH 82, 261

### loss threshold, multi-path 280

## M

### MAC addresses 102, 267

### management traffic, encrypting 275

### manual and automatic installation 28

### marking method, multi-path 280

### marking methods, multi-path 115

### maximum bandwidths

- inbound 174, 286
- outbound
  - configuring 158, 165, 288
  - overriding 162

### max-mem topology setting 98, 294

### MD5

- for IPSec 193, 198
- for IPsec 275
- for OSPF 281

### MDI/MDI-X buttons 32, 37, 48

### meta packets

- configuring size and wait time 299
- disabling multi-packet 299
- IP compression 298
- wait time 299

### minimum WAN speed 168, 289

### monitoring applications 130, 277

### MSR symbol size 300

### multi-flow emulation 138, 298

### multi-node configurations

- about 315
- hardware installation 317
- running quick setup 321
- viewing the status 324

### multiple paths, configuring 113

- defining endpoints 119, 280
- defining templates 117, 279
- router configuration 121

### multiple tunnels on the SR-100 311

## N

### names, special characters in 58

### NetFlow records, generating 238, 313

### network

- cables, connecting 29, 34, 39, 45, 317
- interfaces, configuring
  - in front panel 36, 41, 47
  - in Web/CLI 60, 271
- settings, configuring
  - in front panel 36, 40, 47
  - in Web/CLI 59, 273

### Network Sequence Mirroring, see "NSM"

### non-SR endpoints, outbound QoS 168, 290

### NSM

- defining applications 130, 296
- defining endpoints 128, 296
- file pre-synchronization 139, 297
- overflow mode 296

### NTP, configuring 63, 311



## O

- off-path deployment
  - configuring 104, 282
  - installing 28
- operator access, securing 87, 309
- OSPF, configuring 70, 281
- outbound QoS
  - about 146
  - aggregate WAN speed
    - about 149
    - defining 155, 166, 288
  - and packet flow acceleration 182
  - configuration procedure 154
  - congestion control 168, 289
  - dedicated and oversubscribed WANs 149
  - defining endpoints 156, 166, 289
  - defining settings by endpoint 161, 195
  - defining templates 155, 164, 288
  - defining traffic classes 157, 163, 288
  - excluding LAN/WAN addresses 169
  - non-SR endpoints 168, 290
  - report 214
  - starting and stopping 172
  - ToS/DSCP prioritization 172, 287
  - ToS/DSCP values 170, 291
  - using the Setup Wizard 155
- overflow mode, NSM 296
- overflow, traffic volume 210
- oversubscribed WANs 149

## P

- packet age-out setting 288
- packet capture
  - changing the password 89, 309
  - using 237, 252
- packet flow acceleration
  - active flow pipelining 184, 188, 262
  - fast connection setup 184, 187, 262
  - flow pipelining 184, 186, 262
  - forward error correction 184, 262
  - reports 217
- packet fragments, reducing 271
- packet interception 104, 282
- packet size distribution statistics 211
- pass-phrase, IPSec 192, 275
- passthrough statistics 209
- passwords
  - default 31
  - defining 85, 260
  - OSPF 70, 281
  - packet capture 89, 309
  - registration server 77, 303
  - RIP 70, 105, 305

- peak data reduction 205
- performance data, exporting 242
- periodic interface mode test 272
- ping utility 235, 253
- point-to-multipoint configuration 19
- policy routes, defining gateways by application 300
- policy-based routing for packet interception 105, 282
- port numbers
  - common application 357
  - in application definitions 93, 266
  - RADIUS server 84, 292
  - required for TCP and UDP 27
  - viewing on Traffic by Port report 277
- post-installation tasks 56
- power cable, connecting 318
- preferred assemblers 137, 297
- preferred path 118, 279
- pre-installation tasks 27, 316
- pre-synchronization, file 139
- primary boot image 254
- prime time
  - defining 103, 284
  - viewing on reports 202
- privilege level, user 86, 260
- Profile Mode
  - about 359
  - converting to live operation 375
  - defining remote subnets 284, 370
  - excluding traffic to the local subnet 372
  - running Quick Setup 367
  - virtual devices 284, 370
- protocols, in application definitions 94, 266

## Q

- QoS
  - inbound
    - configuring 173, 285
    - report 215
  - outbound, see "outbound QoS"
- queue lengths
  - inbound QoS 286
  - outbound QoS 288

## R

- rack-mount installation 317
  - SR-15 29
  - SR-50 and SR-55 34, 45
  - SR-80 and SR-100 38
- RADIUS servers and server groups, defining 84, 292
- rebooting the device 234, 254
- recompression and tunnel switching
  - about 141
  - enabling 298

- recovery image 254
- recovery packets, forward error correction 184, 263
- Reduced traffic class 173, 285
- reduction subnets
  - configuring 126, 301
  - filtering source/destination 100
- reduction tunnels 123, 295
- registration servers
  - configuring 76, 303
  - configuring in Quick Setup 49
- remote circuit speeds
  - and router overhead 148
  - configuring 156, 167, 289
- remote routes, viewing 132, 304
- reports
  - about 201
  - acceleration 217
  - application summary 207
  - data reduction 204
  - fast connection setup 219
  - flow pipelining 217
  - forward error correction 221
  - inbound bandwidth 215
  - outbound bandwidth 214
  - packet size distribution 211
  - passthrough traffic 209
  - throughput 202
  - top traffic 222
- retransmissions, RADIUS 85, 292
- retries, SSH login 82, 261
- RIP
  - for dynamic routes 70, 305
  - for packet interception 104, 282
- rolling back to a previous release 231, 255
- route injection 104, 282
- router balancing
  - route-based 74, 306
  - router-based using ToS 307
- router configuration
  - for multiple paths 121
  - for packet interception 107
- routes
  - adding static 69, 306
  - configuring local 67
  - from OSPF 70, 281
  - from RIP 70, 305
  - importing from a file 72, 251
  - LAN-WAN check 299
  - polling from a router 71, 308
  - remote, viewing 132, 304
- RTT
  - and meta-packet wait times 299
  - reported by ping 235, 253

- reported by traceroute 236, 257

## S

- Safe Mode 234, 254
- sample topologies 16
- secondary boot image 254
- secondary IP address, multi-path 116, 278
- secondary registration server 76, 303
- secret key, RADIUS 85, 292
- secure wipe 233, 252
- security associations 274
- security features 80
  - changing the packet capture password 89, 309
  - controlling operator access 87, 309
  - defining local users 85, 260
  - defining RADIUS servers and server groups 84
  - securing front panel access 88, 309
  - selecting authentication methods 81, 260
- Sequence Mirror devices
  - enabling NSM 128, 296
  - enabling NSM for applications 130, 296
  - file pre-synchronization 139, 297
  - rebooting 234, 254
  - wiping the disks 233, 252
- serial number, locating 64
- serial port
  - baud rate, setting 269
  - default settings 31
- Server/Client Summary 244
- servers
  - NetFlow 238
  - NTP 63, 311
  - RADIUS 84, 292
  - registration 76, 303
  - SR-100
    - connecting client devices 43
    - disconnecting client devices 44
    - installing 38
    - Server/Client Summary 244
  - Syslog 66, 312
- setting up the chassis 317
- Setup Wizard
  - IPSec 191
  - outbound QoS 155
- SM-500 installation 45
- SNMP
  - configuring 65, 310
  - list of traps 339
- SNTP, configuring 63, 311
- software passthrough 33, 42
- source address in RADIUS packets 293
- source/destination subnets 100
- special characters 58

- specifications, device 325
- SR-100 clients
  - and multiple tunnels 311
  - client-mode command 311
  - connecting 43
  - disconnecting 44
  - Server/Client Summary 244
- SR-15, SR-20, and SM-250 installation 29
- SR-50 and SR-55 installation 34
- SR-80 and SR-100 installation 38
- SSH interface
  - downloading SSH applications 245
  - enabling and disabling 309
  - using 321
- static routes, adding 69, 306
- statistics
  - acceleration 217
  - application 207
  - data reduction 204
  - exporting 242
  - inbound bandwidth 215
  - interface 271
  - interpreting CSV 349
  - outbound bandwidth 214
  - packet size distribution 211
  - passthrough traffic 209
  - throughput 202
  - top traffic 222
- straight-through cable 29, 34, 39, 45, 317
- subnet mask, configuring
  - in CMS 28
  - in front panel 36, 40, 47, 319, 366
  - in Web/CLI 59, 273
- subnets
  - advertising for reduction 126, 301
  - defining whether encryption is required 194, 199, 276
  - discovering 67
  - excluding from default assemblers 136, 297
  - excluding from outbound QoS 169, 291
  - excluding from reduction 100, 270
  - unadvertised subnets and outbound QoS 153
- support
  - browser 48
  - generating diagnostic files 243, 257
  - technical 14
- switch-to-wire 16
- symbol size, MSR 300
- Syslog
  - configuring 66, 312
  - list of messages 339
- system log file 240, 258
- system software, upgrading 231, 257

## T

### TCP

- required ports 27
- traffic class 173, 285
- technical support 14
- templates
  - IPSec, defining 197, 274
  - multi-path, defining 117, 279
  - outbound QoS
    - defining 164, 288
    - names of 162, 287
- terminal emulation program 31, 246, 321
- throughput statistics 202
- time settings
  - manual 63, 269
  - NTP server 63, 311
- timeout
  - idle user 86, 260
  - RADIUS server 85, 292
  - registration server 303
- top traffic report, configuring 222, 313
- topology
  - sample 16
  - setting 97, 293
- ToS/DSCP values
  - defining by QoS traffic class 170, 291
  - in application definitions 94, 266
  - in multi-path configurations 116, 279
  - in Peribit packets 300
  - using for outbound QoS prioritization 172, 287
- traceroute utility 236, 257
- traffic classes
  - inbound 173, 285
  - outbound 157, 163, 288
- traps
  - configuring 65
  - list of 339
- tunnel mode 138, 298
- tunnel switching
  - about 141
  - enabling 298
- tunnels, reduction 123, 295

## U

### UDP

- and heartbeat packets 265, 298
- and meta packets 138
- changing to IP compression on meta packets 298
- required ports 27
- unadvertised subnets and outbound QoS 153

- undefined applications
  - defining
    - from top traffic 222
    - manually 90, 265
- upgrading the SRS software 231, 257
- URLs, in application definitions 94, 266
- user names and passwords
  - default 31
  - defining 85, 260

## V

- validating remote routes 133, 304
- virtual Peribit devices, in Profile Mode 284, 370
- VLAN 802.1q support 62, 272

## W

- WAN circuit speeds 148, 168, 289
- WAN reduction subnet
  - CLI option 302
  - for off-path devices 127
- WCCP for packet interception 104, 282
- Web console
  - about 58
  - allowing access 87
  - allowing access by address 309
  - browser support 48
  - enabling and disabling 309
  - logging in 57
- Weighted Fair Queuing 172, 287
- Weighted Strict Priority 172, 287
- wiping the disks 233, 252
- Wizard
  - IPSec 191
  - outbound QoS 155

## Traceroute Copyright License

Copyright (c) 1990, 1993

The Regents of the University of California. All rights reserved.

This code is derived from software contributed to Berkeley by Van Jacobson. Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:

1. Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.
2. Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.
3. All advertising materials mentioning features or use of this software must display the following acknowledgement:

This product includes software developed by the University of California, Berkeley and its contributors.

4. Neither the name of the University nor the names of its contributors may be used to endorse or promote products derived from this software without specific prior written permission.

THIS SOFTWARE IS PROVIDED BY THE REGENTS AND CONTRIBUTORS ``AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE REGENTS OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

## OpenSSL Copyright License

Copyright (c) 1998-2000 The OpenSSL Project. All rights reserved.

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:

1. Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.
2. Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.
3. All advertising materials mentioning features or use of this software must display the following acknowledgment:

“This product includes software developed by the OpenSSL Project for use in the OpenSSL Toolkit.  
(<http://www.openssl.org/>)”

4. The names “OpenSSL Toolkit” and “OpenSSL Project” must not be used to endorse or promote products derived from this software without prior written permission. For written permission, please contact [openssl-core@openssl.org](mailto:openssl-core@openssl.org).
5. Products derived from this software may not be called “OpenSSL” nor may “OpenSSL” appear in their names without prior written permission of the OpenSSL Project.
6. Redistributions of any form whatsoever must retain the following acknowledgment:

“This product includes software developed by the OpenSSL Project for use in the OpenSSL Toolkit  
(<http://www.openssl.org/>)”

THIS SOFTWARE IS PROVIDED BY THE OpenSSL PROJECT ``AS IS" AND ANY EXPRESSED OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE OpenSSL PROJECT OR ITS CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

Original SSLeay License

Copyright (C) 1995-1998 Eric Young ([ey@cryptsoft.com](mailto:ey@cryptsoft.com))

All rights reserved.

This package is an SSL implementation written by Eric Young ([ey@cryptsoft.com](mailto:ey@cryptsoft.com)).

The implementation was written so as to conform with Netscapes SSL.

This library is free for commercial and non-commercial use as long as the following conditions are aheared to. The following conditions apply to all code found in this distribution, be it the RC4, RSA, lhash, DES, etc., code; not just the SSL code. The SSL documentation included with this distribution is covered by the same copyright terms except that the holder is Tim Hudson ([tjh@cryptsoft.com](mailto:tjh@cryptsoft.com)).

Copyright remains Eric Young's, and as such any Copyright notices in the code are not to be removed. If this package is used in a product, Eric Young should be given attribution as the author of the parts of the library used.

This can be in the form of a textual message at program startup or in documentation (online or textual) provided with the package. Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:

Redistributions of source code must retain the copyright notice, this list of conditions and the following disclaimer.

Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.

All advertising materials mentioning features or use of this software must display the following acknowledgement:

“This product includes cryptographic software written by Eric Young (eay@cryptsoft.com)”

The word 'cryptographic' can be left out if the routines from the library being used are not cryptographic related :-).

If you include any Windows specific code (or a derivative thereof) from the apps directory (application code) you must include an acknowledgement:

“This product includes software written by Tim Hudson (tjh@cryptsoft.com)”

THIS SOFTWARE IS PROVIDED BY ERIC YOUNG ``AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE AUTHOR OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

The licence and distribution terms for any publicly available version or derivative of this code cannot be changed. i.e. this code cannot simply be copied and put under another distribution licence [including the GNU Public Licence.]

## **GNU GENERAL PUBLIC LICENSE**

Version 2, June 1991

Copyright (C) 1989, 1991 Free Software Foundation, Inc.

59 Temple Place - Suite 330, Boston, MA 02111-1307, USA

Everyone is permitted to copy and distribute verbatim copies

of this license document, but changing it is not allowed.

### **Preamble**

The licenses for most software are designed to take away your freedom to share and change it. By contrast, the GNU General Public License is intended to guarantee your freedom to share and change free software—to make sure the software is free for all its users. This General Public License applies to most of the Free Software Foundation's software and to any other program whose authors commit to using it. (Some other Free Software Foundation software is covered by the GNU Library General Public License instead.) You can apply it to your programs, too.

When we speak of free software, we are referring to freedom, not price. Our General Public Licenses are designed to make sure that you have the freedom to distribute copies of free software (and charge for this service if you wish), that you receive source code or can get it if you want it, that you can change the software or use pieces of it in new free programs; and that you know you can do these things.

To protect your rights, we need to make restrictions that forbid anyone to deny you these rights or to ask you to surrender the rights. These restrictions translate to certain responsibilities for you if you distribute copies of the software, or if you modify it.

For example, if you distribute copies of such a program, whether gratis or for a fee, you must give the recipients all the rights that you have. You must make sure that they, too, receive or can get the source code. And you must show them these terms so they know their rights.

We protect your rights with two steps: (1) copyright the software, and (2) offer you this license which gives you legal permission to copy, distribute and/or modify the software.

Also, for each author's protection and ours, we want to make certain that everyone understands that there is no warranty for this free software. If the software is modified by someone else and passed on, we want its recipients to know that what they have is not the original, so that any problems introduced by others will not reflect on the original authors' reputations.

Finally, any free program is threatened constantly by software patents. We wish to avoid the danger that redistributors of a free program will individually obtain patent licenses, in effect making the program proprietary. To prevent this, we have made it clear that any patent must be licensed for everyone's free use or not licensed at all.

The precise terms and conditions for copying, distribution and modification follow.

## **TERMS AND CONDITIONS FOR COPYING, DISTRIBUTION AND MODIFICATION**

**0.** This License applies to any program or other work which contains a notice placed by the copyright holder saying it may be distributed under the terms of this General Public License. The "Program", below, refers to any such program or work, and a "work based on the Program" means either the Program or any derivative work under copyright law: that is to say, a work containing the Program or a portion of it, either verbatim or with modifications and/or translated into another language. (Hereinafter, translation is included without limitation in the term "modification".) Each licensee is addressed as "you".

Activities other than copying, distribution and modification are not covered by this License; they are outside its scope. The act of running the Program is not restricted, and the output from the Program is covered only if its contents constitute a work based on the Program (independent of having been made by running the Program). Whether that is true depends on what the Program does.

**1.** You may copy and distribute verbatim copies of the Program's source code as you receive it, in any medium, provided that you conspicuously and appropriately publish on each copy an appropriate copyright notice and disclaimer of warranty; keep intact all the notices that refer to this License and to the absence of any warranty; and give any other recipients of the Program a copy of this License along with the Program.

You may charge a fee for the physical act of transferring a copy, and you may at your option offer warranty protection in exchange for a fee.

**2.** You may modify your copy or copies of the Program or any portion of it, thus forming a work based on the Program, and copy and distribute such modifications or work under the terms of Section 1 above, provided that you also meet all of these conditions:

a) You must cause the modified files to carry prominent notices stating that you changed the files and the date of any change.

b) You must cause any work that you distribute or publish, that in whole or in part contains or is derived from the Program or any part thereof, to be licensed as a whole at no charge to all third parties under the terms of this License.

c) If the modified program normally reads commands interactively when run, you must cause it, when started running for such interactive use in the most ordinary way, to print or display an announcement including an appropriate copyright notice and a notice that there is no warranty (or else, saying that you



provide a warranty) and that users may redistribute the program under these conditions, and telling the user how to view a copy of this License. (Exception: if the Program itself is interactive but does not normally print such an announcement, your work based on the Program is not required to print an announcement.)

These requirements apply to the modified work as a whole. If identifiable sections of that work are not derived from the Program, and can be reasonably considered independent and separate works in themselves, then this License, and its terms, do not apply to those sections when you distribute them as separate works. But when you distribute the same sections as part of a whole which is a work based on the Program, the distribution of the whole must be on the terms of this License, whose permissions for other licensees extend to the entire whole, and thus to each and every part regardless of who wrote it.

Thus, it is not the intent of this section to claim rights or contest your rights to work written entirely by you; rather, the intent is to exercise the right to control the distribution of derivative or collective works based on the Program.

In addition, mere aggregation of another work not based on the Program with the Program (or with a work based on the Program) on a volume of a storage or distribution medium does not bring the other work under the scope of this License.

**3.** You may copy and distribute the Program (or a work based on it, under Section 2) in object code or executable form under the terms of Sections 1 and 2 above provided that you also do one of the following:

- a) Accompany it with the complete corresponding machine-readable source code, which must be distributed under the terms of Sections 1 and 2 above on a medium customarily used for software interchange; or,
- b) Accompany it with a written offer, valid for at least three years, to give any third party, for a charge no more than your cost of physically performing source distribution, a complete machine-readable copy of the corresponding source code, to be distributed under the terms of Sections 1 and 2 above on a medium customarily used for software interchange; or,
- c) Accompany it with the information you received as to the offer to distribute corresponding source code. (This alternative is allowed only for noncommercial distribution and only if you received the program in object code or executable form with such an offer, in accord with Subsection b above.)

The source code for a work means the preferred form of the work for making modifications to it. For an executable work, complete source code means all the source code for all modules it contains, plus any associated interface definition files, plus the scripts used to control compilation and installation of the executable. However, as a special exception, the source code distributed need not include anything that is normally distributed (in either source or binary form) with the major components (compiler, kernel, and so on) of the operating system on which the executable runs, unless that component itself accompanies the executable.

If distribution of executable or object code is made by offering access to copy from a designated place, then offering equivalent access to copy the source code from the same place counts as distribution of the source code, even though third parties are not compelled to copy the source along with the object code.

**4.** You may not copy, modify, sublicense, or distribute the Program except as expressly provided under this License. Any attempt otherwise to copy, modify, sublicense or distribute the Program is void, and will automatically terminate your rights under this License. However, parties who have received copies, or rights, from you under this License will not have their licenses terminated so long as such parties remain in full compliance.

**5.** You are not required to accept this License, since you have not signed it. However, nothing else grants you permission to modify or distribute the Program or its derivative works. These actions are prohibited by law if you do not accept this License. Therefore, by modifying or distributing the Program (or any work based on the Program), you indicate your acceptance of this License to do so, and all its terms and conditions for copying, distributing or modifying the Program or works based on it.

**6.** Each time you redistribute the Program (or any work based on the Program), the recipient automatically receives a license from the original licensor to copy, distribute or modify the Program subject to these terms and conditions. You may not impose any further restrictions on the recipients' exercise of the rights granted herein. You are not responsible for enforcing compliance by third parties to this License.

**7.** If, as a consequence of a court judgment or allegation of patent infringement or for any other reason (not limited to patent issues), conditions are imposed on you (whether by court order, agreement or otherwise) that contradict the conditions of this License, they do not excuse you from the conditions of this License. If you cannot distribute so as to satisfy simultaneously your obligations under this License and any other pertinent obligations, then as a consequence you may not distribute the Program at all. For example, if a patent license would not permit royalty-free redistribution of the Program by all those who receive copies directly or indirectly through you, then the only way you could satisfy both it and this License would be to refrain entirely from distribution of the Program.

If any portion of this section is held invalid or unenforceable under any particular circumstance, the balance of the section is intended to apply and the section as a whole is intended to apply in other circumstances.

It is not the purpose of this section to induce you to infringe any patents or other property right claims or to contest validity of any such claims; this section has the sole purpose of protecting the integrity of the free software distribution system, which is implemented by public license practices. Many people have made generous contributions to the wide range of software distributed through that system in reliance on consistent application of that system; it is up to the author/donor to decide if he or she is willing to distribute software through any other system and a licensee cannot impose that choice.

This section is intended to make thoroughly clear what is believed to be a consequence of the rest of this License.

**8.** If the distribution and/or use of the Program is restricted in certain countries either by patents or by copyrighted interfaces, the original copyright holder who places the Program under this License may add an explicit geographical distribution limitation excluding those countries, so that distribution is permitted only in or among countries not thus excluded. In such case, this License incorporates the limitation as if written in the body of this License.

**9.** The Free Software Foundation may publish revised and/or new versions of the General Public License from time to time. Such new versions will be similar in spirit to the present version, but may differ in detail to address new problems or concerns.

Each version is given a distinguishing version number. If the Program specifies a version number of this License which applies to it and “any later version”, you have the option of following the terms and conditions either of that version or of any later version published by the Free Software Foundation. If the Program does not specify a version number of this License, you may choose any version ever published by the Free Software Foundation.

**10.** If you wish to incorporate parts of the Program into other free programs whose distribution conditions are different, write to the author to ask for permission. For software which is copyrighted by the Free Software Foundation, write to the Free Software Foundation; we sometimes make exceptions for this. Our decision will be guided by the two goals of preserving the free status of all derivatives of our free software and of promoting the sharing and reuse of software generally.

## **NO WARRANTY**

**11.** BECAUSE THE PROGRAM IS LICENSED FREE OF CHARGE, THERE IS NO WARRANTY FOR THE PROGRAM, TO THE EXTENT PERMITTED BY APPLICABLE LAW. EXCEPT WHEN OTHERWISE STATED IN WRITING THE COPYRIGHT HOLDERS AND/OR OTHER PARTIES PROVIDE THE PROGRAM “AS IS” WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESSED OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. THE ENTIRE RISK AS TO THE QUALITY AND PERFORMANCE OF THE PROGRAM IS WITH YOU. SHOULD THE PROGRAM PROVE DEFECTIVE, YOU ASSUME THE COST OF ALL NECESSARY SERVICING, REPAIR OR CORRECTION.

**12. IN NO EVENT UNLESS REQUIRED BY APPLICABLE LAW OR AGREED TO IN WRITING WILL ANY COPYRIGHT HOLDER, OR ANY OTHER PARTY WHO MAY MODIFY AND/OR REDISTRIBUTE THE PROGRAM AS PERMITTED ABOVE, BE LIABLE TO YOU FOR DAMAGES, INCLUDING ANY GENERAL, SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF THE USE OR INABILITY TO USE THE PROGRAM (INCLUDING BUT NOT LIMITED TO LOSS OF DATA OR DATA BEING RENDERED INACCURATE OR LOSSES SUSTAINED BY YOU OR THIRD PARTIES OR A FAILURE OF THE PROGRAM TO OPERATE WITH ANY OTHER PROGRAMS), EVEN IF SUCH HOLDER OR OTHER PARTY HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.**

## **END OF TERMS AND CONDITIONS**

### How to Apply These Terms to Your New Programs

If you develop a new program, and you want it to be of the greatest possible use to the public, the best way to achieve this is to make it free software which everyone can redistribute and change under these terms.

To do so, attach the following notices to the program. It is safest to attach them to the start of each source file to most effectively convey the exclusion of warranty; and each file should have at least the “copyright” line and a pointer to where the full notice is found.

one line to give the program's name and an idea of what it does.

Copyright (C) yyyy name of author

This program is free software; you can redistribute it and/or modify it under the terms of the GNU General Public License as published by the Free Software Foundation; either version 2 of the License, or (at your option) any later version.

This program is distributed in the hope that it will be useful, but WITHOUT ANY WARRANTY; without even the implied warranty of MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE. See the GNU General Public License for more details.

You should have received a copy of the GNU General Public License along with this program; if not, write to the Free Software Foundation, Inc., 59 Temple Place - Suite 330, Boston, MA 02111-1307, USA. Also add information on how to contact you by electronic and paper mail.

If the program is interactive, make it output a short notice like this when it starts in an interactive mode:

Gnomovision version 69, Copyright (C) year name of author

Gnomovision comes with ABSOLUTELY NO WARRANTY; for details type `show w'. This is free software, and you are welcome to redistribute it under certain conditions; type `show c' for details.

The hypothetical commands `show w' and `show c' should show the appropriate parts of the General Public License. Of course, the commands you use may be called something other than `show w' and `show c'; they could even be mouse-clicks or menu items--whatever suits your program.

You should also get your employer (if you work as a programmer) or your school, if any, to sign a “copyright disclaimer” for the program, if necessary. Here is a sample; alter the names:

Yoyodyne, Inc., hereby disclaims all copyright interest in the program `Gnomovision' (which makes passes at compilers) written by James Hacker.

signature of Ty Coon, 1 April 1989

Ty Coon, President of Vice

This General Public License does not permit incorporating your program into proprietary programs. If your program is a subroutine library, you may consider it more useful to permit linking proprietary applications with the library. If this is what you want to do, use the GNU Library General Public License instead of this License.

## **KAME Copyright License**

This product contains a modified version of the IPsec software developed by the KAME Project.

Copyright (C) 1995, 1996, 1997, and 1998 WIDE Project.

All rights reserved.

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:

1. Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.
2. Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.
3. Neither the name of the project nor the names of its contributors may be used to endorse or promote products derived from this software without specific prior written permission.

THIS SOFTWARE IS PROVIDED BY THE PROJECT AND CONTRIBUTORS ``AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE PROJECT OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.