Coraid® EtherDrive® VSX

Administration Guide

coraid
REDEFINING STORAGE

Coraid, Incorporated
255 Shoreline Drive, Suite 650
Redwood City, California, 94065
United States of America

Phone:	1-877-548-7200
Fax:	1-706-548-0050
Web:	http://www.coraid.com
Email:	support@coraid.com

CONTENTS

Introduction

Thank you for purchasing the **Coraid® EtherDrive® VSX**. The EtherDrive VSX (VSX) provides a flexible way to virtualize and manage storage on Ethernet SAN appliances such as Coraid's EtherDrive SRX.

VSX virtualization combines existing SRX LUNs into pools as physical volumes, and then assembles small storage units (extents) from the pool into virtual volumes. Virtual volumes, exported as VSX LUNs, redefine and present storage in a fluid and efficient way that is not limited by the physical capacity of individual hard disk drives.

The administrator creates and names the pools and adds entire physical storage volumes (PVs) to the pools. From these pools, components of the PVs (extents) are allocated to logical volumes (LVs) which are named, allocated space, assigned a VSX LUN, and placed online for client access.

Because LVs are made of independent extents, they can be any size. The underlying storage for a logical volume can be spread over several physical volumes or storage appliances.
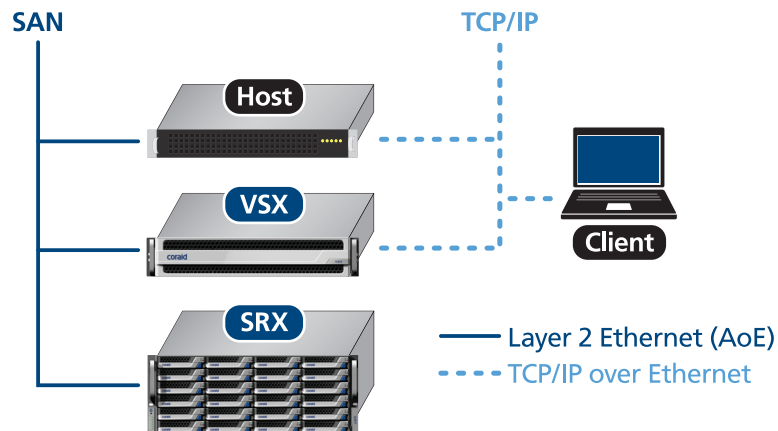
Figure 1:   EtherDrive VSX connected to an Ethernet SAN

VSX can manage data replication to provide redundancy and failure recovery simply and efficiently. VSX administrators can set up one or more forms of replication:

- Synchronous replication (Mirror)—data is written to a physical volume and to a local SRX LUN simultaneously and continuously, while the volume is in use.

- Snapshot—captures a read-only copy of recent changes to an LV at a precise time and saves it in the same pool as the LV. A snapshot library represents a cumulative history of changes to the data since the creation of the first snapshot.

- Asynchronous replication (Shadow)—copies a snapshot of a particular LV and saves it to a specified target on a remote VSX.

- Clone—makes a read/writable copy of the LV at a precise time.

Additionally, two VSX appliances on the same network can be configured as a 2-node high availability cluster for failure recovery.

Reference documentation

This document describes VSX functions and how to access them. The Coraid web site (www.coraid.com) provides additional information on storage software and concepts, EtherDrive HBA installation and configuration, syslog management, and storage-related commands.

Package Contents

Each VSX package contains the following:

- EtherDrive VSX (2U chassis)
- Power cables (2), one for each power supply
- Rack mount hardware (rails and screws)
- Front bezel and bezel keys

Note: The VSX is shipped with all the necessary software already installed.

Requirements

The following section describes system requirements for the VSX. See Hardware Specifications and Precautions for additional specifications and safety information.

Operating software

The VSX works with a storage area network (SAN) of Coraid SRX appliances. For optimal stability, make sure the Coraid operating software (CorOS) on SRX EtherDrive appliances are upgraded to the latest version before adding a VSX to an existing SAN. For the latest version of CorOS software, contact Coraid Technical Assistance Center (TAC).

Hardware and network connectivity

- Power—The redundant power supply is rated at 700 watts, with IEC C14 power connectors. It requires two grounded outlets, and it is recommended that each be on a separate UPS (uninterruptible power supply) circuit furnishing 100VAC to 240VAC, 50 or 60Hz power.

- IP Ethernet ports—All models include two 1-GB Ethernet ports which can operate at 10Mb/second, 100Mb/second, and 1Gb/second. Use high-quality cables and label each cable at both ends.

- SAN Ethernet ports—VSX models have the following SAN port configurations (make sure you use high-quality cables):

  - 8 x 1GbE RJ-45 ports (use category 6 cables)

  - 2 or 4 x 10GbE RJ-45 ports (category 6a cables recommended; category 6 for short distances)

  - 2 or 4 x 10GbE CX4 ports

  - 2 or 4 x 10Gb SFP+ ports

- Keyboard ports—Includes support for PS/2 or USB keyboards.

- VGA port—Monitor port for console support.

- RS-232 serial port—Alternative console connection support. Default parameters on the serial port are 9600 bits/second, no parity, and 1 stop bit.

- Network switch—For SAN communication the switch must support jumbo frames with an MTU size of 9000 and it is recommended that it also support flow control (IEEE 802.3x). Most midrange network switches support these standards.

- EtherDrive Host Bus Adapter (HBA)— Must be installed on the Ethernet SAN where the VSX and SRX appliances are installed. An HBA performs the translation of the disk requests to AoE requests and transmits them to the SAN.

- SRX— Before you configure the VSX, you must configure one or more LUNs on your SRX.

VSX configuration maximums

The following maximum limits are enforced for each VSX appliance on the SAN. Note that additional maximum limits, such as the number of LUNs a host can mount, may be enforced by your HBA.

- 32 pools/VSX appliance

- 128 PVs/VSX pool

- 549TB of PVs/VSX

  The mirrored half of a PV set does not count against this maximum limitation.

- 4,094 snapshots/LV

- 4,080 simultaneous online VSX LUNs/VSX appliance

Terminology and Conventions

The information in this guide assumes familiarity with common data storage and networking concepts and familiarity with data center operations. The following terms are used throughout the documentation and have the following meaning:

Term	Description
Pool	A group of physical volumes. After the physical volumes are added to the pool, they are divided into smaller chunks (extents) that can be regrouped to form logical volumes.
Physical Volume (PV)	Storage appliance RAID targets (SRX LUNs) formatted and added to VSX pools as physical volumes (PVs). PVs use the `shelf.lun` number assigned to the SRX LUN.
Extents	Small chunks of the physical volumes assigned to a pool.
Logical Volume (LV)	Group of extents from a pool used to create virtual disk partitions called logical volumes (LVs). The LVs can then be presented (exported) as VSX LUNs.
Client/host/initiator	The terms client, host, and initiator are used interchangeably to reference the computer accessing the storage over the Ethernet SAN.
Target	The term target is used throughout the document to mean SRX LUNs, VSX LUNs, VSX LVs or a remote VSX appliance. The context of the term target is defined by the command being used. For example, **target** has the following meaning in the usage of these commands: • `aoestat`—SRX LUN or remote VSX LUN • `mkpv`—SRX LUN • `mirror`—SRX LUN **Note:** The shadow commands (`setsecurity`, `setremote`, `shadowrecv`, and `shadowsend`) use the concept of target even though the term target is not part of command usage. See the VSX Command Reference for more information.
`shelf.slot` `shelf.lun`	Refers to the specific number assigned to a SRX LUN or a VSX LUN. `shelf.slot` is used in SRX storage commands and has been replaced by the term `shelf.lun` in this guide. When referring to a specific `shelf.lun`, command usage examples throughout this document use the following conventions: • 7.5 through 7.9—used as SRX LUNs later added to pools as PVs (not used as a mirror target) • 20.5 through 20.9—used as mirror target SRX LUNs • 320.x through 335.x—used as local VSX LUNs • 512.x through 527.x—used as remote VSX LUNs
`VSX shelf>`	A generic prompt used throughout this document in command usage examples to indicate a particular VSX. The VSX prompt changes to indicate the VSX shelf address once the shelf address is assigned using the `shelf` command (e.g., `VSX shelf 320>`).

Overview of Front and Back Panel

After you unpack the VSX, familiarize yourself with the front and back of the VSX before you install it.
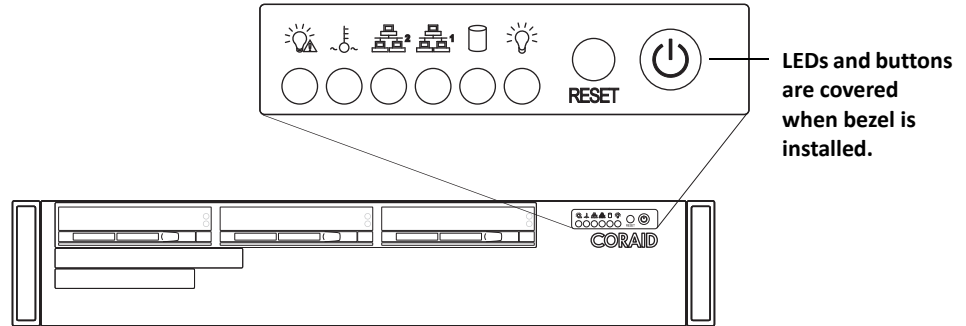
Figure 2: VSX front panel (before bezel is installed)
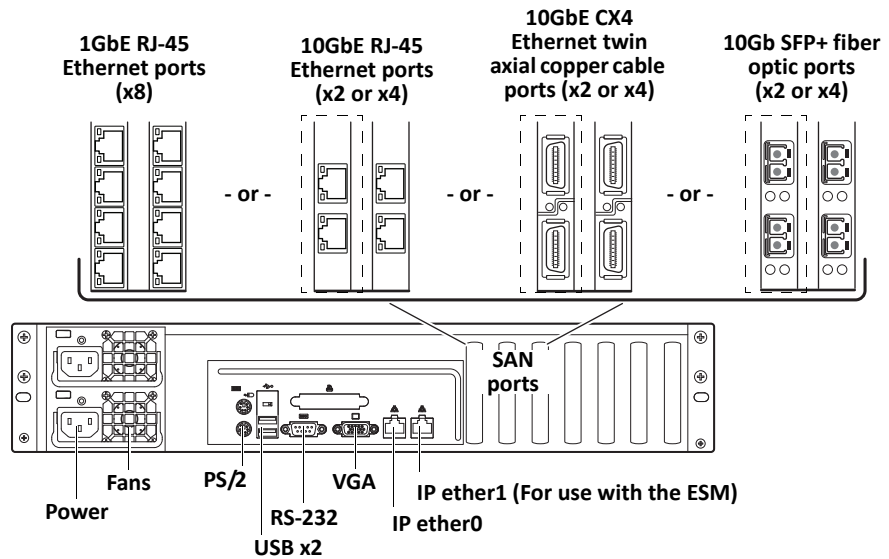
Figure 3: VSX back panel (includes one of the SAN port options)

Port	Description
PS/2 or USB keyboard, RS-232, VGA	Used for initial configuration.
ether0 and ether1	ether0 uses the TCP/IP protocol for: • Communicating with local or remote hosts/clients (SSH) • Updating the CorOS, and shadow replication **Note:** VSX ether1 is reserved for ESM management when configured with 10GbE SAN ports. It is not used to send/receive data.
SAN (see Figure 3 above)	Used for local transmission of AoE packets and HA.

Front panel buttons and indicators are summarized in the table below. After the bezel is installed, the LEDs and buttons are not visible.

Indicator/button	Function
	Solid red indicates a power failure in the power supply.
	• Flashing — indicates a fan failure. • Solid, not flashing — indicates an overheat condition. May be caused by cables obstructing the airflow in the system or an ambient room temperature that is too warm.
	Flashing indicates network activity on the Ethernet (TCP/IP) if the network cable is connected to the port shown in Figure 3.
	Flashing indicates network activity on the SAN (AoE) if the network cable is connected to the port shown in Figure 3.
	Flashing indicates SATA DOM (internal SATA boot module) activity.
	Normally lit when the system's power supply unit is receiving power. • Solid green—on • LED off—power supply is plugged in and turned off, or the system is off but in an abnormal state. Also see the note in To add the VSX to the Ethernet SAN.
RESET	The reset button reboots the system. The Reset button should be used only as a last resort. When the system is rebooted, a consistency check is run.
	The power button applies or removes power from the power supply. Using this button to turn off power removes the main power but keeps standby power supplied to the system. Therefore, you must unplug the appliance if it needs servicing.

Installing the VSX

Installing the VSX appliance on the Ethernet SAN includes the following:

- Unpacking the VSX

- Installing VSX in the rack (optional)

- Connecting power and the VSX cables to the SAN and `ether0`

The following procedure assumes that the Ethernet SAN is up and running.

To add the VSX to the Ethernet SAN

1. **Unpack the box containing the VSX.**

2. **Install the VSX in a standard rack as described in Installing VSX in an Equipment Rack.**

3. **Connect the two power cables to the back of the VSX and to separate UPS outlets.**

   Note: If only one power cable is plugged in, VSX will still power on when the power button is pressed and an audible tone will indicate that there is no power to one of the power units. Instead of green LEDs on the two power units on the rear of the VSX, the LED on the unit that is not receiving power will be yellow.

4. **Connect cables from the VSX SAN ports (see Figure 3) to the SAN via a network switch (the switch must have support for jumbo frames with an MTU size of 9000). SAN port cable configurations include:**

   - 1GbE Cat. 6 (8 cables)

   - 10GbE Cat. 6a recommended (2 or 4 cables)

   - CX4 Ethernet twin axial copper (2 or 4 cables)

   - SFP+ fiber optic (2 or 4 cables)

   Connect the VSX to the same Ethernet segment as the storage appliances it is to virtualize and manage. In particular, there should be no IP gateways or other layer-3 devices between the VSX and the storage appliances.

5. **Connect an Ethernet cable to the VSX `ether0` port (see Figure 3) and connect the other end to the IP network switch.**

   Note: If your configuration includes the ESM and includes 10GbE SAN connections, connect VSX `ether1` to a 1GBE isolated communications network. See the ESM QuickStart for more information.

6. **To configure the VSX via a console, connect one of the following:**

   - A serial terminal or a computer running an application such as minicom to the VSX RS-232 port. Serial port parameters are 9600 bits/second, no parity, and 1 stop bit.

   - A VGA monitor and a PS/2 or USB keyboard to the corresponding ports on the VSX.

7. **Power on the VSX using the button on the front.**

8. **Install the bezel on the front of the chassis:**

   • Remove the plastic wrap around the handles on the front of the chassis to expose two small holes on the inside of the handles.

   • With the bezel upright and at an angle, slide the bezel pins into the handle holes on the left-hand side of the chassis.

   • Once inserted, slide the latch on the right side of the bezel and push the bezel flush up against the front, making sure to line up the pins on the right-hand side of the chassis with the holes in the handle.

   • Release the latch to attach the bezel.
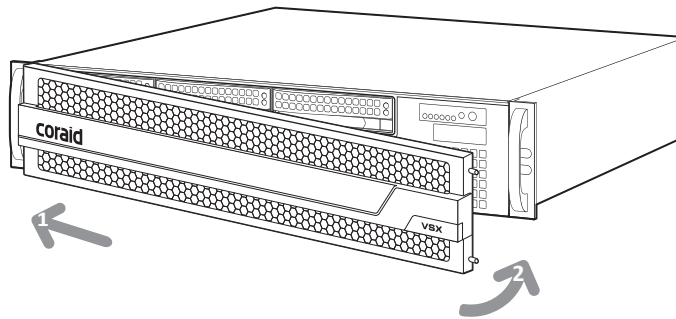
Figure 4:   Attaching the VSX bezel

9. **Continue with Setting up the VSX.**

Setting up the VSX

Before you create virtual storage volumes using the VSX, you need to set up the VSX itself using the following commands:

Function:	Command:
• Change the default password assigned to the VSX.	`passwd`

• Set the IP address, subnet mask and gateway on the VSX so it is accessible over the network.
 	
Note: The IP address and gateway for the VSX are set only once and must be set from the console. The network administrator should assign the IP address, subnet mask, and gateway for the VSX.
	`ipaddress`
	
	`ipgateway`

• Set the time zone and configure the time source.
 	
Synchronizing the clocks on all the appliances on your network is crucial for high-availability configurations, as well as for accurate time stamps, snapshots, replication and logging with any configuration. A Network Time Protocol (NTP) server can be used to obtain a reference time from Internet or other time servers, which is then distributed to connected appliances. The NTP server ensures that all devices linked to it are synchronized. You can also set the time source to local to manually set the time.
	`timezone`
	
	`timesource`

• Check date settings.	`date`
• Configure the VSX shelf address to identify a particular VSX on the SAN.	`shelf`
• Configure the syslog	`syslog`

Note: If your configuration includes a pair of VSX appliances in a high-availability environment, see High-availability Configuration.

To set VSX network parameters

1. **After the console is connected to the VSX and powered on, type** `admin` **(the default password) when prompted for the password.**

   ```
   Coraid VSX
   Copyright (c) 2010 Coraid, Inc
   All Rights Reserved

   Admin Password: *****
   VSX shelf unset>
   ```

   Changing the password is strongly recommended before using the VSX on the network. For more information, see the passwd command.

   Note: The VSX prompt is: `VSX shelf unset>` by default. After you configure the shelf address later in this procedure, the prompt changes to the specified VSX shelf address.

2. **Make sure you have the assigned IP address, subnet mask, and gateway information for the VSX.**

3. **At the prompt, type** `ipaddress` **and enter the IP address and the subnet mask for the** `ether0` **port on the VSX.**

   For example:

   ```
   VSX shelf unset> ipaddress -?
   usage: ipaddress [ { ether0 | ether1 } address mask ]
   VSX shelf unset> ipaddress ether0 10.10.10.145  255.255.255.0
   ```
   In this example:

   ether0 IP address = 10.10.10.145
   Subnet mask = 255.255.255.0

   Note: `ether1` is reserved for 10GbE VSX SAN configurations that include ESM. Do not set the `ether1` IP address.

4. **Type** `ipgateway` **and enter the gateway address for the VSX.**

   ```
   VSX shelf unset> ipgateway 10.10.10.1
   ```

5. **Continue at the console from which you set the VSX IP address, or exit the console and connect to the VSX appliance using SSH. SSH is enabled on the VSX by default, but if it has been disabled, you have to enable it from the console login (see service).**

   To use SSH, connect to the VSX as `admin`, then enter the appropriate password when prompted (the default password is `admin`). For example, begin by typing:

   ```
   ssh admin@10.10.10.145
   ```

    If a DNS name is configured you can use that instead.

   Note: If an `ssh-agent` is enabled, a message will appear in the syslog indicating that there is an ssh public key login failure. The message is expected and can be ignored.

6. **Continue with configuring the time source and time zone.**

To set time zone and time source

1. **Type** `timezone` **and then enter the name of the time zone. For example:**

```
VSX shelf unset> timezone -?
usage: timezone [ -l ] [ timezone ]
VSX shelf unset> timezone US_Eastern
```

For a list of available time zones, type `timezone -l`.

2. **At the VSX shelf prompt, type** `timesource` **and then type one of the following:**

   - `ntp` and the IP address of the NTP server

   - `local` and the year, month, day, hour, minute, and second that you want to use to keep time.

   For example:

```
VSX shelf unset> timesource -?
usage: timesource [ ntp IPaddress | local yyyymmdd.hhmmss ]
```

To use an NTP server as the source:

```
VSX shelf unset> timesource ntp <enter NTP server IP address>
Starting timesync to ntp server
-or-
```

To set the time source to Tue Oct 30 11:33:18 PST 2012:

```
VSX shelf unset> timesource local 20121030.113318
Starting timesync to local RTC
VSX shelf unset>
```

The `timesource` command without an argument displays the IP address of the NTP server you have configured or the time that was set using `local` in the command.

The clocks on primary and secondary VSX appliances in a high-availability configuration must be set to the same time. Ideally, the primary and secondary should be configured to poll the same NTP server (configured using the `timesource` command). If an NTP server is not available:

On the secondary VSX	• Set `timesource` to `local` • Enable `ntp` using the `service` command
On the primary VSX	• Set `timesource` to `ntp` and enter the IP address of the secondary VSX
Note: NTP time is polled approximately every minute. Once configured, changes made to the local time at the secondary VSX can take up to a minute to be reflected on the primary VSX.	

3. **Once the time source and the time zone are configured, type** `date` **at the VSX command prompt to check the VSX date and time.**

To set shelf and syslog

1. **At the VSX prompt, type** `aoestat` **to view a list of SRX shelf addresses already in use on the SAN.**

   Already-used SRX shelf addresses are listed under TARGET in the form `shelf.lun`. The first number represents the SRX shelf address or a remote VSX shelf address. In the example below already-used shelf addresses are 7 and 20.

   ```
   VSX shelf unset> aoestat
   TARGET      SIZE(GB) PORT(S)
   7.5         1000.205 ether2
   7.6         1000.205 ether2
   7.7         1000.205 ether2
   7.8         1000.205 ether2
   7.9         1000.205 ether2
   20.5        1000.205 ether2
   20.6        1000.205 ether2
   20.7        1000.205 ether2
   20.8        1000.205 ether2
   20.9        1000.205 ether2
   ```

   Note: If no targets are listed, type aoediscover to refresh the list of targets. You can also issue the applstat command to check the status of SRX appliances on the SAN. To connect directly to an SRX shelf, issue the applcon command.

2. **Type** `shelf` **and enter a number to be used as the VSX appliance base shelf address. Do not choose a shelf address for the VSX that is already in use by an SRX or another VSX.**

   The VSX shelf address reserves a range of 16 shelf addresses, beginning with the base shelf number, for creating VSX LUNs (e.g., a base shelf address set to 320 would have a range of 320-335). The VSX base shelf address must be a number between 0 and 65504. Its range of addresses *must* not conflict with other shelf addresses on the SAN.

   For example:

   ```
   VSX shelf unset>
   VSX shelf unset> shelf -?
   usage: shelf [ 0 - 65504 ]
   VSX shelf unset> shelf 320
   VSX shelf 320>
   ```

   The VSX prompt changes to indicate the assigned VSX shelf address.

3. **Type** `syslog` **to configure the destination server IP for syslog UDP messages.**

4. **Continue with Configuring VSX Logical Volumes (LVs).**

   Note: In an HA environment:

   • Do *not* set the secondary VSX shelf address

   • Do *not* configure VSX LVs on the secondary VSX

Configuring VSX Logical Volumes (LVs)

After you have set up the VSX, you can add SRX LUNs to VSX pools, create logical volumes and then present VSX-configured LUNs to initiators (see the following figure).
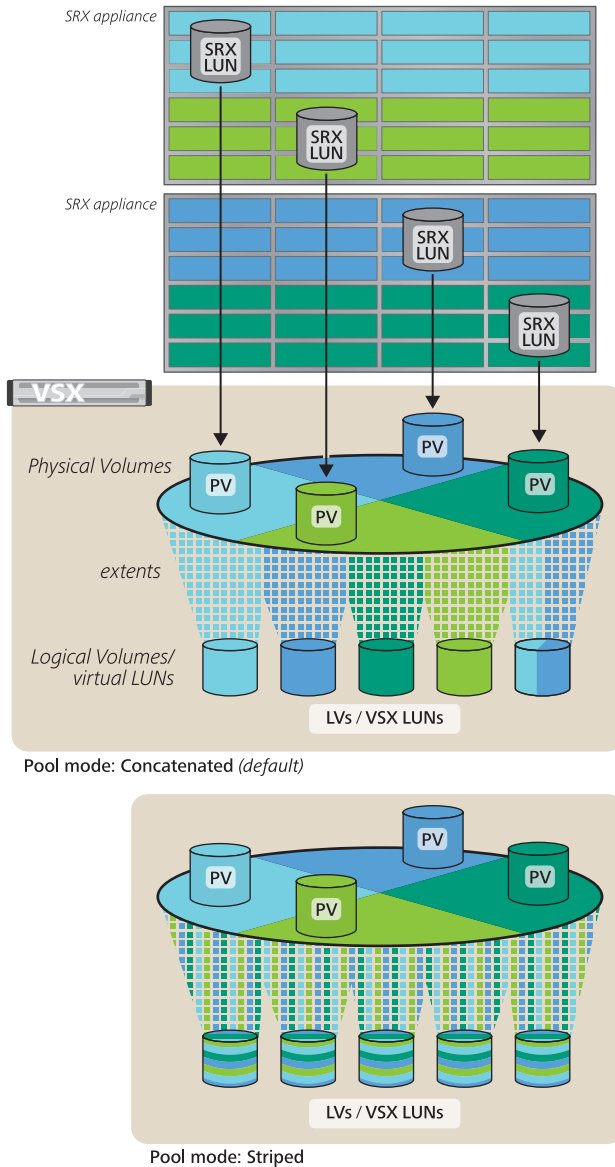
Coraid SRX appliance:
Configure the SRX LUNs (JBOD or RAIDs) and place them online.
See the *SRX Administration Guide* or *ESM Online Help*.

Coraid VSX appliance:	
• Create a pool with a unique name.	mkpool
The extent allocation mode for the pool is set to concat (concatenated) by default. Use the setpoolmode command to change it to striped.	
• Format SRX LUNs into physical volumes (PVs) and add them to the pool.	mkpv
• Make a logical volume (LV) with unique a name.	mklv
LVs are set to thick provisioning by default. Use the -t flag of the mklv command to create a thinly provisioned LV.	
• Configure initiator MAC mask for the LV (optional).	mask
• Assign a VSX LUN to the LV.	mklun
• Place the VSX LUN online.	online
Access VSX LUNs from a host computer. See the EtherDrive HBA documentation.	

Figure 5: Overview of configuring LVs and VSX LUNs

Note: Associating a VSX LUN with an LV allows initiators access to the data as long as the VSX LUN is online. Certain properties of the LV/VSX LUN combination are specifically manipulated in the LV rather than in the VSX LUN directly. For example, masks are set in the LV to restrict VSX LUN access.

19

Make sure to establish SRX LUN(s) before you create VSX LUN(s). Although it is not enforced, it is recommended that all SRX LUN(s) added to a VSX pool share the following properties:

Disk properties	SRX LUN properties
• Same number of disks	• Same RAID type
• Same type of disks (SATA, SAS, SSD)	• Must be online
• Same RPM (Revolutions Per Minute)	• LUN access is not restricted (the VSX will set masks for PVs)
• Same capacity	• Does not have any data stored on it that you would like to preserve (data will be lost when the SRX LUNs are formatted into PVs)
	• Is not being used by any other devices such as initiators or other Coraid appliances on the network
	• Is not allocated to any other pool
	• Same I/O mode configuration (set using the SRX `iomode` command)
	• Same EtherFlash Cache setting (enabled or disabled)

To create a logical volume

1. **Connect to the VSX appliance using SSH. SSH is enabled on the VSX by default, but if it has been disabled, you have to enable it from the console login (see service).**

   To use SSH, connect to the VSX as admin, then enter the appropriate password when prompted (the default password is admin). For example, begin by typing:

   ```
   ssh admin@10.10.10.145
   ```

   In the above example, the IP address 10.10.10.145 is used to connect to the VSX. If a DNS has been configured, you can use it instead.

   Note: If an ssh-agent is enabled, a message will appear in the syslog indicating that there is an ssh public key login failure. The message is expected and can be ignored.

2. **At the VSX prompt, type** aoestat **to view the list of targets (SRX LUNs and remote VSX LUNs) active and online on the Ethernet SAN.**

   Note: SRX LUNs and remote VSX LUNs are listed under TARGET in the form shelf.lun, with the volume size (GB) and the VSX Ethernet port. Only SRX LUNs should be added to VSX pools. Make sure you know which ones are available to the VSX before adding them to any pools.

   ```
   VSX shelf> aoestat
   TARGET       SIZE(GB) PORT(S)
   7.5          1000.205 ether2
   7.6          1000.205 ether2
   7.7          1000.205 ether2
   7.8          1000.205 ether2
   7.9          1000.205 ether2
   20.5         1000.205 ether2
   20.6         1000.205 ether2
   20.7         1000.205 ether2
   20.8         1000.205 ether2
   20.9         1000.205 ether2
   ```

   Note: If no targets are listed, type aoediscover to refresh the list of targets and make sure the VSX SAN ports are properly connected to the SAN network. Also make sure jumbo frames are enabled on the network switch.

   If the following error message is displayed when you issue the aoestat command, it could mean that the TARGET is offline or it has been deleted.

   ```
   error: target [x] is currently not available
   ```

   Issuing the applstat command is also helpful to find out the status of SRX appliances on the SAN. Issue the applflush command to remove targets from the list that are no longer valid.

3. **Type `mkpool name` to create a pool, giving it a unique name. For example, to create two pools with names** `sales` **and** `mktg`**:**

```
VSX shelf> mkpool -?
usage: mkpool name [...]
VSX shelf> mkpool sales
VSX shelf> mkpool mktg
VSX shelf> pools
POOL    #PVs   TOTAL(GB)     FREE(GB)     USED(%)     MODE
sales    0      0.000        0.000        0           concat
mktg     0      0.000        0.000        0           concat
```

name [...]— enter the name you want to assign to the pool (no spaces). You can add multiple pools all at once using the same name differentiated by a number range. Indicate the range by a dash (-). For example, `mkpool sales1-5` makes 5 pools named `sales1`, `sales2`, `sales3`, `sales4`, `sales5`. You can also enter multiple names separated by a space. Each VSX supports a total of 32 pools.

Note: The data extent allocation mode for each pool you create is set to concatenated by default (see the MODE column in the `pools` command output). For information on the changing the data extent allocation mode (`concat` or `striped`) for a particular pool, see setpoolmode.

4. **Type `mkpv pool target` to add SRX LUNs to a pool as physical volumes (PV). For example:**

```
VSX shelf> mkpv -?
usage: mkpv pool target [...]
VSX shelf> mkpv sales 7.5
VSX shelf> mkpv mktg 7.6-9
```

The two commands above add SRX LUN 7.5 to the `sales` pool and SRX LUNs 7.6, 7.7, 7.8, and 7.9 to the `mktg` pool as PVs.

- pool— enter the name of the pool where you want to add the SRX LUN.

- target [...]— specify the SRX LUN (target) you want to format as a PV and add to the pool. If the target includes multiple LUNs in a numbered sequence, you can add multiple SRX LUNs to the pool all at once using a dash (-) to indicate a range (see the example above). You can also add multiple, non-consecutive PVs to a pool using a space between PVs (e.g., `mkpv mktg 7.6 7.8`).

Note: A total of 128 PVs can be added to a single VSX pool.

It is highly recommended that all SRX LUNs added to the pool be the same RAID type and include the same number of hard disk drives within that RAID type. See Disk properties for additional details.

Before issuing the `mkpv` command, make sure:

- The LUN is online

- The LUN has no MAC masks set

  Once an SRX LUN is added to a VSX pool, access to that LUN is restricted to that VSX (the VSX sets a mask to restrict access).   If the VSX is part of an HA pair, access is restricted to both VSX appliances.

- The LUN does not have any data stored on it that you would like to preserve (data is lost when the disks are formatted)

- The LUN is not being used by any other devices such as initiators or other Coraid appliances on the network

- The LUN has the same I/O mode configuration (set using the SRX `iomode` command) as other LUNs in the pool

- The LUN has the same EtherFlash Cache setting (enabled or disabled) as other LUNs in the pool

- The LUN is not allocated to any other VSX pool

  If the LUN is allocated to another pool, an error is reported when you try to add it to a new pool: `error: [target x] already in use`

Note: If you want to add SRX LUNs that have already been configured and have data stored, contact Coraid Technical Assistance Center for information on preserving the data before formatting the LUNs as PVs.

For information about establishing a mirror relationship between a PV and an SRX LUN, see Mirror.

5. **Type** `pvs` **to get a list of the current PVs.**

```
VSX shelf> pvs
PV      TOTAL(GB)    FREE(GB) MIRROR        STATE           POOL
7.5     1000.205     900.165                single          sales
7.6     1000.205     900.165                single          mktg
7.7     1000.205     900.165                single          mktg
7.8     1000.205     900.165                single          mktg
7.9     1000.205     900.165                single          mktg
```

6. **Type** `mklv [-t] pool size[T,G,M,K] name [...]` **to create a new read/ write logical volume (LV) from one or more PVs in the pool. For example, to create a 100GB logical volume named Athens in the sales pool (by default data extents are immediately allocated from the PVs in the pool):**

```
VSX shelf> mklv -?
usage:  mklv [-t] pool size[T,G,M,K] name [...]
VSX shelf> mklv sales 100G Athens
VSX shelf>
```

- `[-t]`—enter the optional flag `-t` to create a thinly provisioned LV (i.e, data extents are allocated as needed).

- `pool`—enter the name of the pool used to allocate storage to the LV

- `size[T,G,M,K]`—enter the amount of space you want to allocate to that LV

  The size of the LV must be entered in decimal form followed by `T`, `G`, `M` or `K` to indicate the size in Terabytes, Gigabytes, Megabytes, or Kilobytes, respectively. If no letter is specified, the number is interpreted as a byte count.

- `name[...]`—enter the name you want to assign to the LV. The LV name must be unique across all pools on the VSX, alphanumeric, and limited to 16 characters. You can add multiple LVs of the same size all at once using the same name differentiated by numbers. Indicate the range using a dash (-). For example:

  ```
  VSX shelf> mklv sales 100G Athens1-10
  ```

  See mklv for more information.

7. **Type** `lvs` **to get a list of the read/write LVs you just created.**

   Note: MAC masks (including MAC addresses of initiators and VSX LUNs) are added at the LV level and control the way VSX LUNs are presented to initiators. For more information on how to add MAC masks to LVs, see the mask command.

   MAC masks are not copied over to LVs that have been replicated using data replication commands (i.e., snapshot, shadow replication, and clone commands).

8. **Continue with To make the LV available to initiators.**

To make the LV available to initiators

1. **Type** `lvs` **to get a list of available logical volumes.**

```
VSX shelf> lvs
LV          SIZE(GB) MODE      LUN POOL  PROV SHADOW     STATE
Athens      100.000  r/w           sales thick         healthy
```

2. **Type** `mklun LV LUN` **where** `LV` **is the name of the logical volume and** `LUN` **is a number you assign to the VSX LUN. See** **mklun** **for information on creating multiple VSX LUNs all at once.**

   `mklun` assigns a VSX LUN to an LV. In the following example, `330.1` is assigned to the VSX LUN. Because `320` is the VSX base shelf address (normally found in the VSX prompt), that number and the next 15 numbers in the sequence (321-335) can be assigned as VSX LUNs (the shelf portion of `shelf.lun`). The second number (to the right of the decimal point) can be any number between 0 and 254.

   In other words, each VSX appliance can support up to 4,080 VSX LUNs, with an assigned LUN number from 0 to 254. In order to allow for all 4,080 VSX LUNs, each VSX base shelf address owns the shelf addresses from that base address to base+15. For example, a VSX appliance with a shelf address of 320 will allow you to address VSX LUNs 320.0, 320.1, etc. all the way through 335.254.

```
VSX shelf> mklun -?
usage: mklun LV [... to] LUN [...]
VSX shelf> mklun Athens 330.1
VSX shelf> luns
LUN         STATUS      LV      SIZE(GB)  MODE      MASKS
330.1       offline     Athens  100.000   r/w          0
```

3. **Type** `online LUN` **where** `LUN` **is the specified VSX LUN assignment, to make the VSX LUN available on the network. For example:**

```
VSX shelf> online 330.1
```

4. **Type** `luns` **and note that** `online` **is indicated under the** `STATUS` **column.**

```
VSX shelf> luns
LUN         STATUS      LV      SIZE(GB)  MODE      MASKS
330.1       online      Athens  100.000   r/w          0
```

   VSX LUNs that you have placed online are now accessible to local servers or clients. VSX LUNs are only accessible starting on the `ether2` SAN port. Placing a VSX LUN online without an initiator mask set will broadcast the VSX LUN to all servers on the SAN.

5. **To make additional changes to pools, PVs, or LVs, see Managing virtual storage pools.**

Managing virtual storage pools

After you have created pools, LVs, and VSX LUNs, you can change the virtual storage configuration using available commands. Some usage examples are provided in the table below. For details about each command, see VSX Command Reference.

Note: When issuing the commands referenced below, it is assumed you are logged into the VSX from an SSH client.

To:	Use commands:
Change the data extent allocation mode for a VSX pool.	• `pools` To get a list of VSX pools and their mode setting. • `setpoolmode` To change the data extent allocation mode to `concat` or `striped`.
Configure a VSX LUN MAC mask on the LV.	• `mask` To get a list of VSX LUNs and any current MAC masks. • `offline` To offline any VSX LUNs prior to setting the MAC mask (if LUNs have been created and placed online). • `mask [{+|-}mac ...] [LV ...]` To add a list of MAC addresses for a specified VSX LV or VSX LV range. • `online` To allow network access to VSX LUNs.
Increase the pool size (add PVs)	• `aoestat` To get a list of available SRX LUNs. • `pvs` To get a list of SRX LUNs that have already been formatted as PVs and are already committed to pools. • `mkpv` To format an SRX LUN as a PV and add it to the pool thereby increasing the overall size of the pool.
Increase the size of an LV **Note:** The `lvresize` command is only used to increase the size of an LV.	• `lvs` To see a current list of LVs and their size in GB. • `lvresize` To increase the size of the specified LV. • `lvs` To verify the change.

To:	Use commands:
Change the read/write mode of a VSX LV	• `lvs` To see a current list of LVs and their r/w mode. • `readwrite` To change the specified VSX LV mode to read/write. • `readonly` To change the specified VSX LV mode to read-only.
Create thinly provisioned LVs	• `lvs` To see the current configuration of LVs (`PROV` column) • `lvthin` To change a thick provisioned LV to thin provisioned. Also see lvthick.
Offline a VSX LUN so that it is no longer available on the network.	• `luns` To check the online/offline status of VSX LUNs. • `offline` To change the VSX LUN status from online to offline.
Remove VSX LUN	• `luns` To get a list of VSX LUNs. • `offline` To place the VSX LUN offline before removing it. • `rmlun` To disassociate a VSX LUN from the LV thereby removing the VSX LUN.
Remove LVs	**Note:** First remove any VSX LUNs associated with the LV before removing an LV (see above). After removing any associated VSX LUNs, you can use: • `lvs` To get a list of LVs. • `rmlv` To remove any associated snapshots. **Note:** If the LV is configured for shadow replication, you will need to break the shadow connection to remove the latest snapshot in the series (see unshadow). • `rmlv` To remove the LV.

To:	Use commands:

Remove PVs from a pool (decrease pool size)	**Note:** First remove any VSX LUNs and LVs associated with the PV before removing a PV (see above). After removing any associated VSX LUNs and LVs, you can use:
	
	• `pvs`
	
	  To get a list of PVs.
	
	• `rmpv`
	
	  To remove a PV from the pool, thereby decreasing the overall size of the pool. If the PV contains dirty extents (allocated), an error is indicated when attempting to delete the PV (see rmpv).

Remove a pool	**Note:** First remove any associated VSX LUNs, LVs and PVs before removing a pool (see previous).
	
	• `pools`
	
	  To get a list of existing pools.
	
	• `rmpool`
	
	  To remove the pool.

To add legacy SR/SRX LUNs to an existing pool. A legacy LUN is an SR/SRX LUN with existing data on it created using EM/EMX, or by direct access.	Contact Coraid Technical Assistance Center.

Data Replication

The following table includes information about the various ways to replicate your storage data. See the sections indicated below for more information on each option.

Type:	Purpose:	Description	For information see:
Mirror Synchronous writes of a PV	Identical copy of all data in real time.	All data written to a PV is written to a designated SRX LUN simultaneously while the volume is in use. The designated SRX LUN and PV should not be in the same shelf. Multiple PVs can be mirrored at the same time to a series of SRX LUNs. If any PV in a pool is mirrored, all PVs in that pool should be mirrored with an equivalent SRX LUN to ensure consistent performance and to protect each extent in the pool. Data written to a mirrored set is acknowledged by both the PV and the SRX LUN before acknowledgement is sent back to the host, ensuring two identical copies.	Mirror
Snapshot	Read-only copy (snapshot) of an LV at a precise time.	A copy of the LV data is preserved at a precise time and saved as a snapshot in the same pool as the source LV. It is saved as a numbered read-only copy.	Snapshots of logical volumes
Shadow Asynchronous read-only copy of a snapshot to a second VSX LV.	Back up snapshots to a second typically remote VSX LV.	Each snapshot taken is copied asynchronously to a specified, typically remote VSX LV. Multiple LVs can be shadowed at the same time to a series of VSX LVs. Multiple LVs can queue up multiple snapshots, and copy them in parallel asynchronously.	Shadow
Clone Read/write copy of an LV	Independent copy of an LV made at a precise time.	A copy of the LV data is preserved at a precise time and saved with a unique name as a read/writable copy in the same pool as the source LV. Clones are often used for testing software changes on real data without affecting the source data.	Clone a logical volume or snapshot

Note: Any MAC masks that have been set for VSX LVs are not copied over when data is replicated.

Mirror

Mirroring (synchronous replication), using the **mirror** command, creates a simultaneous, exact duplicate of a PV and writes it to a designated SRX LUN (*mirror target*). The original PV that is part of the pool is called the *primary*, and the target SRX LUN which is not part of a VSX pool is the *mirror target*. To set up a mirror relationship, you must select the primary PV from the unmirrored PVs and select the mirror target from the SRX LUNs that are not part of any pool. The primary PV and the mirror target should share the same disk and SRX LUN properties (see Disk properties and SRX LUN properties).

VSX ensures synchronization by executing writes to both the primary and the mirror target before responding to the host. Requests for reads are serviced alternately from the primary and mirror target when the PV mirror is fully redundant.

To ensure that a particular LV in the pool is mirrored, all PVs in the related pool must have a mirror configured. After mirrors are configured for all PVs in the pool, any LVs created from the related pool are mirrored automatically.
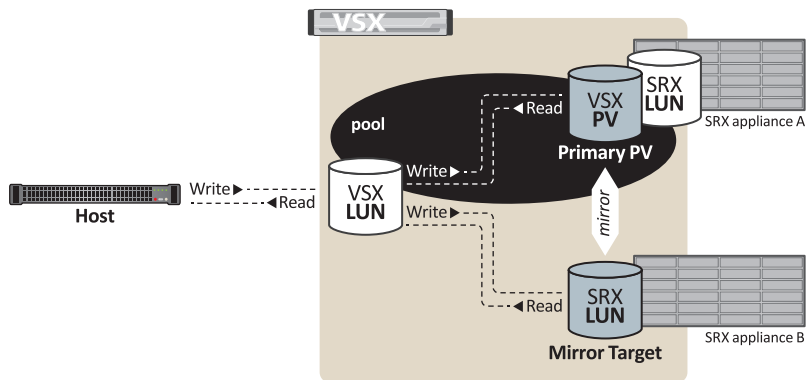
Figure 6:   Mirrored PV (mirror command)

To specify a mirror

1. **Set up the PVs you want to mirror.**

   See the instructions in the first five steps of To create a logical volume. Mirrors can be added to existing PVs that are being used by online VSX LUNs.

2. **Type** pvs **for a list of the current PVs and their status. Any PV whose** STATE **is** single **may be the primary for the mirror.**

   ```
   VSX shelf> pvs
   PV              TOTAL(GB)    FREE(GB) MIRROR    STATE        POOL
   7.5             1000.205     900.165            single      sales
   7.6             1000.205     900.165            single       mktg
   7.7             1000.205     900.165            single       mktg
   7.8             1000.205     900.165            single       mktg
   7.9             1000.205     900.165            single       mktg
   ```

3. **Type** aoestat **to get a list of all SRX LUNs from which you will select the mirror.**

   In the example below, 7.5 through 7.9 have already been formatted into PVs (they appear in the pvs output).

   ```
   VSX shelf> aoestat
   TARGET      SIZE(GB) PORT(S)
   7.5         1000.000 ether2
   7.6         1000.000 ether2
   7.7         1000.000 ether2
   7.8         1000.000 ether2
   7.9         1000.000 ether2
   20.5        1000.000 ether2
   20.6        1000.000 ether2
   20.7        1000.000 ether2
   20.8        1000.000 ether2
   20.9        1000.000 ether2
   ```

4. **Use the** `mirror` **command to specify a mirror relationship between a PV (primary) and a designated SRX LUN (mirror target). To mirror a single PV, enter only the PV and the mirror target.**

The mirror target must be an SRX LUN that is not in use, not another PV, and must be of equal or greater size than the PV. Designate an SRX LUN in a different shelf as the mirror target.

For example, to mirror a single PV:

```
VSX shelf> mirror -?
usage: mirror PV [... to] target [...]
VSX shelf> mirror 7.5 20.5
```

-or-

To mirror more than one PV at a time, use the series expansion, which links the PV and the SRX LUN series using the keyword `to`. For example:

```
VSX shelf> mirror 7.6-9 to 20.6-9
```

The first expanded PV string is matched to the first expanded target string, followed by the second string to second string, and so on. An error is indicated if the number of expanded strings is different for PVs and SRX LUNs.

5. **Type** `pvs` **again to confirm that the PVs are mirrored.**

```
VSX shelf> pvs
PV      TOTAL(GB)   FREE(GB)    MIRROR      STATE       POOL
7.5     1000.205    900.165     20.5      mirrored      sales
7.6     1000.205    900.165     20.6      mirrored      mktg
7.7     1000.205    900.165     20.7      mirrored      mktg
7.8     1000.205    900.165     20.8      mirrored      mktg
7.9     1000.205    900.165     20.9      mirrored      mktg
```

Note: The `MIRROR` and `STATE` entries changed:

• The `MIRROR` entry now shows the mirror targets (SRX LUN).

• The `STATE` entry, now `mirrored,` indicates that a mirror connection between a PV and an SRX LUN has been made. `single` indicates that a mirror connection does not exist.

Use the wstat command to get status information during the mirror process.

Broken mirrors

If a mirror fails, the VSX continues to use the primary PV for I/O transactions. If the primary fails and the mirror target is in sync with the primary, the mirror target becomes the primary PV. In this case, a message in the syslog notifies the user that the PV mirror failed.

Note: A failed primary PV defaults to the mirror target 30 seconds after I/O access to it, therefore I/O access to the disk may appear to hang for 30 seconds while the failover is in process.

Once the primary PV and the mirror target are online, the VSX automatically updates extents on the half of the mirror that is out of sync. Automatic partial resilvering (i.e, automatically updating the changed extents) is attempted according to the following schedule:

1. **Three minutes after the mirror breaks**
2. **Once every 15 minutes for the first hour after the mirror breaks**
3. **Once an hour for the rest of time**

As part of the update process, broken is reported in the STATE column of the pvs command output until both the primary PV and mirror target are online and updated.

Note: In some cases, even though both the PV and the mirror target are online, it can take a few cycles for the automatic extent updates to start processing. Therefore, if the targets are online and you don't see the updates in process, wait for the next few cycles before attempting other remedies. However, if the VSX is between cycles you can try issuing the mirror command to start the extent updates.

Mirrors can be broken intentionally using the commands unmirror or brkmirror:

- unmirror—releases the connection between the mirror target and the primary PV. The mirror target (SRX LUN) is not added to the pool. pvs command STATE output is set to single.

Note: brkmirror—keeps the mirror relationship but breaks I/O to the mirror target. This is helpful when you want to temporarily stop I/O to the mirror target but want to keep the mirror connection. pvs command STATE output is set to broken. This command disables automatic extent updates (i.e, automatic partial resilvering); issue the mirror command to update extents on the mirror target.

Additional mirror commands

You can manage existing mirrors with related commands, outlined in the table. See the VSX Command Reference for detailed descriptions.

To:	Use commands:
Release the mirrored target	`unmirror PV [...]` Enter the primary PV in the command to dissociate the mirror target from the primary PV. The mirror target can now be used for other purposes (`mkpv`, or another `mirror`).
Stop I/O to the mirror target	`brkmirror PV [...]` Enter the primary PV in the command to stop I/O to the corresponding mirror target. To re-establish I/O and update extents on the mirror target, issue the mirror command.
Release the primary PV (after promoting the mirror target to primary)	• `promote mirrorTarget` To exchange primary and mirror, where `mirrorTarget` is the mirrored SRX LUN. **Note:** The mirror must be fully synchronized to perform this action. • `unmirror PV [...]` To release the former primary.
To establish a new mirror target connection	• `unmirror PV [...]` Enter the primary PV in the command to release the connection to the original mirror target. • `mirror` To establish a new mirror target.

Snapshots of logical volumes

The VSX can make a space-efficient, read-only copy of an LV called a snapshot. The snapshot of the LV represents the data at a precise time and any subsequent changes to the original LV are not written to the snapshot. A series of successive snapshots represents a cumulative history of changes to the data since the first snapshot was created. Each snapshot is stored in the same pool as the source LV and is saved as `LVname.1`, `LVname.2`, `LVname.3` etc. The date and time is saved with each snapshot so you can recover snapshots from a particular point in time.

Once a snapshot has been taken, the snapshot shares data extents with the source LV. Other LV characteristics, such as masks and the VSX LUN association are not shared. When the source LV is written, extents are remapped to create LV private copies, leaving snapshot extents read-only. This section is divided into the following topics:

Manual snapshot	Snapshot schedule	Snapshot hold	Additional functions
Related commands:	Related commands:	Related commands:	Related commands:
• `snap`	• `setsnaplimit`	• `sethold`	• `lvsnaps`
	• `snaplimit`	• `clrhold`	• `rollback`
	• `setsnapsched`		
	• `snapsched`		
	• `clrsnapsched`		

To allow network access to the snapshot data, clone the snapshot, assign a VSX LUN to it and then place it online. When the snapshot is cloned the initiator can assign a new universally unique identifier (UUID) to the clone (LV) to avoid any conflict with the UUID of the original LV.

Snapshots are created manually using the snap command or automated using the setsnapsched command.
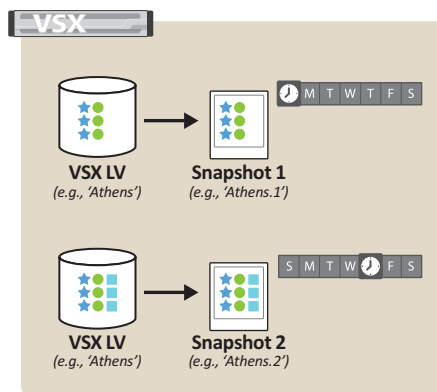
Figure 7:   Snapshot of LV (manual or scheduled)

To create a manual snapshot of an LV

1. **Type** `lvs` **to get a list of LVs and VSX LUNs.**

   Note: Before creating a snapshot of an LV, it is recommended that you quiesce the application(s) or filesystem(s) interacting with the VSX LUN.

2. **Use the** `setsnaplimit` **command to configure the maximum amount of space from the pool that can be used for snapshots of a specified LV (the command default setting is** `ignore`**). See setsnaplimit for command parameters.**

   For example, to set the snapshot limit to 10G for LV Athens:

   ```
   VSX shelf> setsnaplimit -?
   usage: setsnaplimit [ size[T,G,M,K] | ignore ] LV [ LV ... ]

   VSX shelf> setsnaplimit 10G Athens
   Request to setsnaplimit 1 snapshot limit: Athens
   'n' to cancel, 'a' for all, or 'y' to setsnaplimit to 10G on
   Athens [n]: y
   VSX shelf>
   ```

3. **Type** `snaplimit` **to confirm that the appropriate amount of space from the pool is allowed for snapshots.**

   ```
   VSX shelf> snaplimit
   LV                  LIMIT(GB)      USED(GB)
   Athens                 10.000         0.000
   VSX shelf>
   ```

   If the snapshot limit is not set or set to `ignore`, `ignore` is displayed in the `LIMIT (GB)` column.

4. **Use the** `snap` **command to create a read-only copy (snapshot) of a specified LV. For example:**

   ```
   VSX shelf> snap -?
   usage: snap LV [...]
   VSX shelf> snap Athens
   VSX shelf>
   ```

   A snapshot of `Athens` at that precise moment is created and displayed as `Athens.1`. By default the snapshot hold setting is enabled and the snapshot cannot be automatically removed when space is required. To disable the hold setting, see clrhold.

5. **Type** `lvsnaps` **to confirm that the snapshot is available. The** `CLASS` **entry indicates** `manual` **and the** `HOLD` **entry is** `enabled`**. All manual snapshots have the hold setting enabled by default (see Snapshot hold setting).**

Snapshots reside in the same pool as the LV. Use the `pools -a` command to get a list of LVs, snapshots, and clones in a particular pool.

The date is displayed in the format: Year, Month, Day, Hour, Minute, Second.

```
VSX shelf> lvsnaps
SNAPSHOT            DATE    SIZE(GB)   CLASS      SCHEDULE     HOLD
Athens.1 20120216.145747   100.000    manual                  enabled
VSX shelf>
```

To allow network access to snapshot data, use the `clone` command to make a copy of the snapshot (with read/write permissions) and then the `mklun` and `online` commands to place the LV online.

Snapshot schedules

Snapshot schedules are configured so that a snapshot of a specified LV is automatically taken hourly, daily, weekly, monthly, or yearly depending on the parameters set in the setsnapsched command. A total of 32 snapshot schedule instances can be configured per LV.

The number of snapshots retained is configurable within each schedule instance. If a retain limit is set, then old snapshots are automatically removed when the retain limit is reached. To retain all snapshots for that schedule instance, the retain limit can be set to hold. For more information on how to enable or disable the snapshot hold setting, see Snapshot hold setting.

Note: In addition to setting a retain limit for the snapshot schedule instance to remove old snapshots, old snapshots are also removed if the snapshot space limit for the pool is reached (see setsnaplimit).

If the snapshot space limit or the snapshot retain limit is reached, the VSX does the following:

- Snapshot space limit reached (setsnaplimit):

Snapshot hold setting	Description
Enabled	The VSX does not take a snapshot as scheduled.
Disabled	The VSX removes the oldest snapshot associated with the LV (the snapshot may be manual or part of a schedule).

- Snapshot retain limit reached (setsnapsched):

Snapshot hold setting	Description
Enabled	The VSX does not take a snapshot as scheduled.
Disabled	The oldest snapshot in the group of snapshots for that schedule instance is removed. If there are no snapshots to remove, the scheduled snapshot is not taken.

Note: Snapshots queued for shadow replication cannot be automatically removed. In addition, when the retain limit or the space limit is reached the last snapshot copied from the source VSX and the last snapshot on the target VSX cannot be removed automatically nor using the rmlv command. See Shadow for details on shadow replication.

If you decide to delete a snapshot schedule (clrsnapsched command), the snapshots associated with that schedule no longer count against the schedule retain limit. If the snapshot limit for the LV is reached and the hold setting is disabled for all snapshots, any of those snapshots may be removed. If you create a new snapshot schedule using the same parameters of a previously cleared snapshot schedule (same class and time), any snapshots that were created previously are inherited by the newly created schedule.

To create a snapshot schedule

1. **Type** `lvs` **to get a list of LVs and any associated VSX LUNs.**

   Note: Before creating a snapshot of an LV, it is recommended that you quiesce the application(s) or filesystem(s) interacting with the VSX LUN.

2. **Use the** `setsnaplimit` **command to configure the maximum amount of space from the pool that can be used for snapshots of a specified LV (the command default setting is** `ignore`**). See** setsnaplimit **for command parameters.**

   For example, to set the snapshot limit to 10G for LV Athens:

   ```
   VSX shelf> setsnaplimit -?
   usage: setsnaplimit [ size[T,G,M,K] | ignore ] LV [ LV ... ]

   VSX shelf> setsnaplimit 10G Athens
   Request to setsnaplimit 1 snapshot limit: Athens
   'n' to cancel, 'a' for all, or 'y' to setsnaplimit to 10G on
   Athens [n]: y
   VSX shelf>
   ```

3. **Type** `snaplimit` **to confirm the amount of space from the pool allowed for snapshots.**

   ```
   VSX shelf> snaplimit
   LV               LIMIT(GB)    USED(GB)
   Athens              10.000       0.000
   VSX shelf>
   ```

4. **Use the** `setsnapsched` **command to create a snapshot schedule for a specified LV. For command details, see** setsnapsched. **For example:**

   ```
   VSX shelf> setsnapsched -?
   usage: setsnapsched class time retain LV [...]
   ```

   To create a daily snapshot of the Athens LV at 17:15 (hold setting enabled):

   ```
   VSX shelf> setsnapsched daily @17:15 hold Athens
   ```

   -or-

   To create a daily snapshot of the Athens LV at 18:15 with a retain limit of 5:

   ```
   VSX shelf> setsnapsched daily @18:15 5 Athens
   ```

   The value entered for the retain parameter must be a number between `1` and `256` or set to `hold` to retain all snapshots.

5. **Type** `snapsched` **to confirm the schedule.**

   ```
   VSX shelf> snapsched
   LV               CLASS        TIME      RETAIN
   Athens           daily        @17:15      hold
   Athens           daily        @18:15         5
   VSX shelf>
   ```

   See the clrsnapsched command to remove a snapshot schedule.

Snapshot hold setting

Snapshots can be retained or automatically removed depending on whether the snapshot hold setting is enabled or disabled. If the snapshot hold setting is enabled, the snapshot *cannot* be automatically removed when snapshot limits are reached (i.e., snapshot space limit or the snapshot schedule retain limit). If the snapshot hold setting is disabled, the snapshot *can* be removed when snapshot limits are reached.

Note: Snapshots with the hold setting enabled *can* be removed using the rmlv command.

The snapshot hold setting can be enabled or disabled in the following ways:

• Manual snapshots—hold setting is enabled by default

  Manual snapshots taken using the snap command are not candidates to be removed when either the pool space limit is reached or the snapshot schedule retain limit is reached.

• Scheduled snapshots—hold setting is configured in the retain parameter of the setsnapsched command and can be enabled or disabled for all future snapshots in that schedule instance.

  If scheduled snapshots have a retain limit set, all snapshots that are part of the schedule instance have the hold setting disabled and the oldest snapshot in the group is removed when the specified retain limit is reached. If the retain limit is set to hold, all the snapshots that are part of the schedule instance have the hold setting enabled and cannot be removed.

• All snapshots—sethold and clrhold commands (changes the hold setting on a manual or scheduled snapshot).

  The sethold command changes the hold setting to enabled and can be used to prevent certain snapshots from being inadvertently removed. The snapshot retain limit configured in the setsnapsched command does not affect hold-enabled snapshots (i.e., hold-enabled snapshots are no longer eligible to be removed). The clrhold command changes the hold setting to disabled so that a snapshot can be removed.

  See Additional snapshot commands for more information.

Additional snapshot commands

You can manage existing snapshots with related commands, outlined in the table below. For detailed descriptions, see the VSX Command Reference.

To:	Use commands:
Remove a snapshot	• `lvsnaps` To get a list of LV snapshots. • `rmlv` To remove a particular snapshot. The specified snapshot is removed regardless of its hold configuration. **Note:** If the LV is configured for shadow replication, you will need to break the shadow connection to remove the latest snapshot in the series (see unshadow).
Clone a snapshot	• `lvsnaps` To get a list of LV snapshots. • `clone` To clone a specified snapshot.
Copy snapshots to a target (remote) VSX.	See Shadow.
Roll back an LV to a specified snapshot	• `lvs` To get a list of LVs and associated VSX LUNs. • `offline` To offline any online VSX LUNs associated with the LV. • `lvsnaps` To get a list of LV snapshots. • `rollback` To select a snapshot to use to rollback the LV.

To:	Use commands:
Remove a snapshot schedule.	• `snapsched` To get information regarding existing snapshot schedules • `clrsnapsched` To remove a particular snapshot schedule.
Enable hold setting on a snapshot so it cannot be deleted.	• `lvsnaps` To get a list of LV snapshots and hold settings. • `sethold` To enable the hold setting on a specified snapshot or a series of snapshots.
Disable the hold setting on a snapshot.	• `lvsnaps` To get a list of LV snapshots and hold settings. • `clrhold` To disable the hold setting on a specified snapshot or a series of snapshots.

Shadow

Shadow replication is an asynchronous copy of a VSX snapshot to a remote VSX.

Note: It is possible to set up local shadow replication within the same VSX. See Setting up local shadow replication.

The group of shadow commands allow you to create a connection between one source VSX and a target VSX, allowing snapshots to be copied from one VSX to another. This section describes configuration for the following shadow replication functions:

Shadow security	Remote Name	LV shadow	Remove shadow
Related commands: • `certhash` • `setsecurity` • `security`	Related commands: • `setremote` • `remote`	Related commands: • `shadowrecv` (issued on the target VSX) • `shadowsend` (issued on the source VSX)	Related commands: • `unshadow`

When a snapshot of a shadowed LV is taken and saved in a VSX pool, the source VSX copies the snapshot (read-only LV) to a specified target VSX LV in the background. If the connection to the target VSX goes down, all snapshots taken during that down time are copied over to the target VSX after the connection is re-established.

The target VSX must be configured so that the size of the LV is at least as large as the LV on the source VSX. When configuring multiple source LVs for shadow replication, each of the source LVs must have a different shadow target (VSX LV).

The unshadow command can be used to break the connection between the source LV and the target LV.
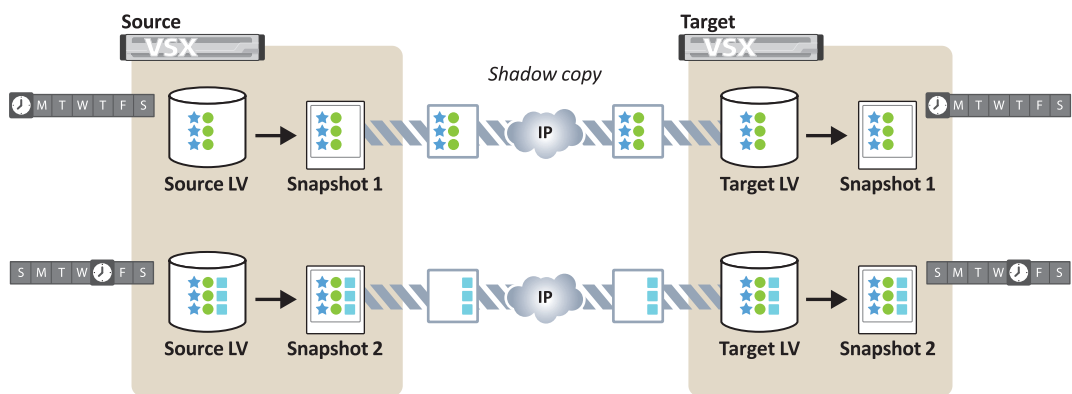
Note: Snapshots are an exact replica of the data on the LV but the shadow replication only copies the differences.

Figure 8: Snapshot shadow replication

Configuring VSX appliances for shadow replication

Prior to configuring VSX appliances for shadow replication, make sure the source and target VSX appliances are set up on the SAN and have pools, PVs, and LVs already configured. Note that target LVs:

- Must be of equal or greater size than the source LV

- Must not have an associated VSX LUN

Configuring snapshot shadow replication between a source VSX and a target VSX over a TCP/IP connection includes:

- Setting up the target and source VSX (required once for a pair of VSX appliances)

Source VSX commands:	Target VSX commands:
certhash	certhash
setsecurity	setsecurity
setremote	setremote

- Configuring the LVs for shadow replication (configure the target VSX LV first)

Source VSX commands:	Target VSX commands:
shadowsend **Note:** Configure shadowsend after configuring the target VSX.	setsnaplimit (to change the snapshot space limit from the default configuration ignore.) shadowrecv setsnapsched (to change retain parameters for snapshots on the target VSX)

If you are using a firewall between source and target VSX appliances, make sure that communication on TCP port 17760 is allowed for the configured IP addresses. TCP port 17760 is used to listen for connections from the shadowsend command.

Setting up local shadow replication

Although the following section uses the term target VSX to indicate a second VSX appliance, you can also replicate snapshots to a target LV within the same VSX appliance. Use the following procedures to configure local shadow replication but keep in mind the following:

- setsecurity command—since a single VSX is the source and the target and the shadow connection never leaves the VSX, there is no need to set encryption. null is the recommended setting for the setsecurity command in this case.

- shadowrecv and shadowsend commands—the target LV should be in a different pool from the source LV.

The IP addresses and shelf addresses below are used in examples throughout the following procedures to indicate the source VSX (original snapshot location) and the target VSX (snapshot copy location):

Source VSX:

- IP address—primary 10.10.10.145
    secondary 10.10.10.156

- VSX Shelf—320

- Remote name (RNAME)—`VSXtarget` (name source VSX assigns to the target VSX)

- Pool—`sales`

- Source LV—`Athens`

Target VSX:

- IP address—20.20.20.36

- VSX Shelf—512

- Remote name (RNAME)—`VSXsource` (name target VSX assigns to the source VSX)

- Pool—`salestarget`

- Target LV—`Athenstarget`

To set up the source and target VSX for shadow replication

1. **Once the source and target VSX appliances are set up on the SAN with LVs, type** `certhash` **at the source and at the target VSX command prompt to get the certificate information for each VSX appliance.**

   The certificate information is required in the `setsecurity` command (step 2).

   Source VSX (for both the primary and secondary VSX in an HA configuration):

   ```
   VSX shelf 320> certhash -?
   usage: certhash

   VSX shelf 320> certhash
   c737c733d7cd7d3d33c3773c3333d7373d77c
   VSX shelf 320>

   VSX shelf inactive> certhash
   m737k733k7m7k3k33m3773m3333k7373m77m
   VSX shelf inactive>
   ```

   Target VSX:

   ```
   VSX shelf 512> certhash
   5f454a5f45455afa4554f4faf4555f4454554f4f5
   VSX shelf 512>
   ```

2. **Type** `setsecurity` **to set up security on the source and target VSX appliance. Make sure the IP address entered is for the remote VSX.**

You must configure the `setsecurity` command in order to configure the `setremote` command in the next step.

Setting security to `null` does not encrypt the connection between the VSX pair. Both the source and target VSX *must* have the same configuration (`encrypt` or `null`) to successfully replicate snapshots.

If the remote VSX is part of an HA pair, issue the `setsecurity` command twice to include both the primary and secondary VSX.

Source VSX (enter the certificate information for the target VSX):

Note: The command line example for the `setsecurity` command below is wrapped to enhance readability.

```
VSX shelf 320> setsecurity -?
usage: setsecurity address [ { encrypt | null } certhash ]

VSX shelf 320> setsecurity 20.20.20.36 encrypt
5f454a5f45455af a4554f4faf4555f4454554f4f5
```

To check the settings, issue the security command at the source VSX command prompt. For example:

```
VSX shelf 320> security
 IP ADDRESS ENCRYPT HASH
20.20.20.36     yes 5f454a5f45455afa4554f4faf4555f4454554f4f5
```

Target VSX (enter the certificate information for the primary and if applicable secondary source VSX):

Note: The command line example for the `setsecurity` command below is wrapped to enhance readability.

```
VSX shelf 512> setsecurity 10.10.10.145 encrypt
c737c733d7cd7d3d33c3773c3333d7373d77c


VSX shelf 512> setsecurity 10.10.10.156 encrypt
m737k733k7m7k3k33m3773m3333k7373m77m
```

To check the settings, issue the security command at the target VSX command prompt. For example:

```
VSX shelf 512> security
  IP ADDRESS ENCRYPT HASH
10.10.10.145     yes c737c733d7cd7d3d33c3773c3333d7373d77c
10.10.10.156     yes m737k733k7m7k3k33m3773m3333k7373m77m
```

3. **Type** `setremote` **to configure a remote name (RNAME) for the VSX/VSX HA pair.**

The RNAME is used to link an HA pair to one name. That name is then used to set up the shadow replication parameters in the `shadowrecv` and `shadowsend` commands. In the example below, shelf 320 is part of an HA pair (Primary IP address 10.10.10.145; Secondary IP address 10.10.10.156). If the VSX is not part of an HA pair just enter the single IP address.

Source VSX:

```
VSX shelf 320>  setremote -?
usage: setremote RNAME [ address ] [ address ]

VSX shelf 320> setremote VSXtarget 20.20.20.36
VSX shelf 320> remote
              NAME      IP ADDRESS      IP ADDRESS
          VSXtarget    20.20.20.36
```

Target VSX:

```
VSX shelf 512>  setremote VSXsource 10.10.10.145 10.10.10.156
VSX shelf 512> remote
              NAME      IP ADDRESS      IP ADDRESS
          VSXsource   10.10.10.145    10.10.10.156
```

Once the source and target VSX appliances are linked for shadow replication, select source LVs to shadow to target LVs.

In addition to setting a snapshot limit on the source VSX, set a snapshot limit on the target VSX as well to ensure that all the free space in the pool is not used up. By default, the snapshot limit is set to `ignore` for new LVs. A setting of `ignore` means there is no mechanism to limit the number of saved snapshots and therefore you may need to manage the number of saved snapshots manually to avoid using up the free space in the pool (see setsnaplimit).

To shadow an LV

1. **Once the source and target VSX appliances have been set up, type** `lvs` **on each VSX appliance to get a list of available LVs.**

   If the `SHADOW` column in the `lvs` command output is blank (`send` or `recv` is not indicated), then the LV is not part of a shadow relationship and is available to use to configure a shadow relationship.

   Note: If you have not done so already, issue the `setsnaplimit` command on the target LV (`Athenstarget`) and change the default configuration from `ignore` to the maximum amount of space from the pool that you want to allocate for replicated snapshots. See setsnaplimit for more information.

2. **At the target VSX command prompt type** `shadowrecv` **to configure a relationship between source LV snapshots and a designated target LV. See shadowrecv for information on command parameters.**

   In the following example, `VSXsource` is the RNAME of the remote VSX, `Athens` is the source LV, and `Athenstarget` is the designated target LV. RNAME in the following example is the remote name given to the source VSX appliance using the `setremote` command. The command remote displays the RNAME(s) given to remote VSX appliances.

   Target VSX:

   ```
   VSX shelf 512> shadowrecv -?
   usage: shadowrecv RNAME source_LV [...] to LV [...]

   VSX shelf 512> shadowrecv VSXsource Athens to Athenstarget
   ```

   If a VSX LUN is associated with the target LV, the following error message is reported:

   ```
   error: remove LUN first: rmlun 512.7
   ```

   The target LV must be of equal or greater size than the source LV. Use the `lvs` command to get size information for the LV.

   To configure more than one LV at a time for shadow replication, use the series expansion, which links multiple source LVs to multiple target LVs. For example:

   ```
   VSX shelf 512> shadowrecv VSXsource Athens0-3 to Athenstarget0-3
   ```

   Note: The following error message is displayed if the target LV selected is already in use:
   ```
   error: LV x is using RNAME:targetLV for shadowsend
   ```

3. **Type** `lvs` **or** `lvs -a` **to confirm that the target LV is now shadow enabled (**`recv` **is displayed the shadow column).**

   Target VSX:

   ```
   VSX shelf 512> lvs
   LV            SIZE(GB) MODE   LUN  POOL      PROV SHADOW     STATE
   Athenstarget 100.000  r/w  salestarget   thick   recv    healthy
   ```

4. **Continue from the target VSX command prompt and use the** `setsnapsched` **command to change the snapshot retain limit.**

   By default, all snapshots when received on the target VSX have the hold setting enabled. To change the hold setting for scheduled snapshots on the target VSX:

   - Issue the setsnapsched command from the target VSX command prompt.

   - Enter the same `class` and `time` as the source LV snapshot schedule and change the snapshot retain value for the target LV (older snapshots are removed when the retain limit is reached). On the target VSX LV, the `setsnapsched` command is *only* used to set the retain limit of the shadowed snapshots. The retain limit does not need to be the same as the limit set on the source VSX.

     Note: For information regarding source and target VSX appliances configured for different time zones and the time stamps associated with snapshots, see setsnapsched command and shadow replication.

5. **At the source VSX command prompt type** `shadowsend` **to configure a relationship between the source LV snapshots and the designated target LV. See shadowsend for information on command parameters.**

   In the following example, `VSXtarget` is the RNAME of the remote VSX, `Athens` is the source LV, and `Athenstarget` is the designated target LV. RNAME in the following example is the remote name given to the target VSX appliance using the `setremote` command. The remote command displays the RNAME(s) given to remote VSX appliances.

   Source VSX:

   ```
   VSX shelf 320> shadowsend -?
   usage: shadowsend RNAME LV [...] to target_LV [...]
   VSX shelf 320> shadowsend VSXtarget Athens to Athenstarget
   ```

6. **Type** `lvs` **or** `lvs -a` **to confirm that the source LV is now shadow enabled (**`send` **is displayed in the shadow column).**

Source VSX:

```
VSX shelf 320> lvs
LV          SIZE(GB) MODE   LUN  POOL   PROV    SHADOW    STATE
Athens      100.000  r/w         sales  thick    send     healthy
VSX shelf 320>
```

Now any snapshots taken of the LV `Athens` are asynchronously copied to the remote VSX LV (`Athenstarget`).

Type wstat at the command prompt to get status information regarding the shadow process. For example:

```
VSX shelf 320> wstat
ACTION                            DONE(%) RATE(MB/s)        TTC
shadow Athens->Athenstarget@VSXtarget  34    20.41      00:03:52
```

Additional shadow commands

You can manage the shadow connection with related commands, outlined in the table. For detailed descriptions, see the VSX Command Reference.

To:	Use commands:
Remove a shadow connection	• `lvs` To get a list of LVs that have shadow enabled (`send` or `recv` in the SHADOW column). • `unshadow` Issued on both the target VSX and the source VSX to break the connection between a source LV and target VSX LV (see unshadow for more information).
Remove the entire shadow configuration	• `lvs` To get a list of LVs that have shadow enabled (`send` or `recv` in the SHADOW column). • `unshadow` Issued on both the target VSX and the source VSX to break the connection between a source LV and target VSX LV (see unshadow for more information). • `setremote RNAME` Issued on both the target VSX and the source VSX to remove the remote name assignments (see setremote). Also see remote for the current configuration. • `setsecurity address` Issued on both the target VSX and the source VSX to remove the security configuration between the two VSX appliances (see setsecurity). Also see security for the current configuration.
Access snapshot data (shadowed snapshots) on the target VSX LV	Connect to the target VSX and then use the following commands to convert the desired snapshot to a VSX LUN: • `lvsnaps` To get a list of available snapshots. • `clone` To clone the desired snapshot. • `mklun` To assign a VSX LUN to the clone. • `online` To make the VSX LUN available on the SAN. Once the snapshot is converted to a VSX LUN and placed online it can be mounted from a host.

Clone a logical volume or snapshot

Using the clone command, the VSX can make a copy of an LV, snapshot or another clone and present it as a new LV. Clones reside in the same pool as the LV or snapshot and I/O access permissions for the clone are set to read/write by default. Additionally clones are thinly provisioned by default. All other LV characteristics (server access, shadow enable, VSX LUN association) are not included in the clone. Changes to either the original LV or the cloned LV are independent and do not affect the other. The name of the new cloned LV must be alphanumeric, no more than 16 characters, and unique across all pools.
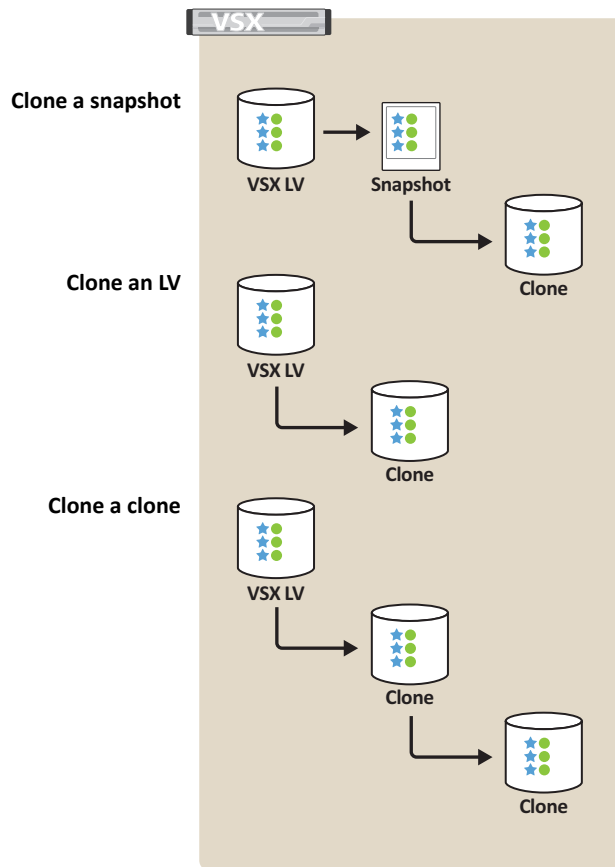
Figure 9:   Clone command options

To clone an LV or snapshot

1. **Type** `lvs` **to get a list of LVs and snapshots.**

   Note: Before creating a clone of an LV, it is recommended that you quiesce the application(s) or filesystem(s) interacting with the VSX LUN.

2. **Use the** `clone` **command to create a read/write copy of a specified LV or snapshot. For example:**

   ```
   VSX shelf> clone -?
   usage: clone orig_LV new_LV [...]
   VSX shelf> clone Athens NYC
   VSX shelf>

   To clone a snapshot enter the name of the snapshot instead of
   the LV name:

   VSX shelf> clone -?
   usage: clone orig_LV new_LV [...]
   VSX shelf> clone Athens.1 NYC
   VSX shelf>
   ```

   A clone of `Athens.1` is created and displayed as `NYC`. You can create snapshots of `NYC` just as you would any LV.

   -or-

   To make more than one clone of an LV or snapshot, use the series expansion, which creates multiple copies of a specified LV. For example:

   ```
   VSX shelf> clone Athens NYC0-3
   VSX shelf>
   ```

3. **Type** `lvs` **to confirm that the clone is available.**

   ```
   VSX shelf> lvs
   LV            SIZE(GB) MODE     LUN POOL   PROV SHADOW     STATE
   Athens        100.000  r/w          sales  thick          healthy
   NYC           100.000  r/w          sales  thin           healthy
   ```

   Clones reside in the same pool as the LV or snapshot and are now available for use with other commands such as `mklun`, `online`, `snap`, and the various shadow commands. The initiator can assign a new universally unique identifier (UUID) to a clone (LV) to avoid any conflict with the UUID of the original LV. Use the `pools -a` command to get a list of LVs, snapshots, and clones in a particular pool.

Additional clone commands

You can manage clones using related commands, outlined in the table below. For detailed descriptions, see the VSX Command Reference.

To:	Use commands:

Remove a cloned LV	**Note:** If a VSX LUN was assigned to the cloned LV, offline and then remove the VSX LUN first. After removing any associated VSX LUNs, you can use:
	
	• `lvs`
	
	  To get a list of LVs (clones).
	
	• `rmlv`
	
	  To remove any associated snapshots.
	
	Note: If the LV (clone) is configured for shadow replication, you will need to break the shadow connection to remove the latest snapshot in the series (see unshadow).
	
	• `rmlv`
	
	  To remove the LV (clone).
	
	Also see rmlv for more information.

Mount the clone from a host.	• `mklun`
	
	  To associate a VSX LUN with the LV (clone).
	
	• `online`
	
	  To place the LV online and make it available on the SAN.

High-availability Configuration

To ensure uninterrupted service in the event of system failure, you can employ a pair of VSX appliances in a high-availability (HA) configuration. (For command information, see VSX Command Reference.) In a typical HA configuration:

• One VSX functions as the primary, active appliance

• One VSX functions as the secondary, inactive appliance

The redundant secondary VSX serves as a backup to the primary VSX in the event of a failure, servicing the SAN storage if the connection to the primary VSX fails. If the secondary VSX detects a failed primary, the secondary VSX automatically becomes the active VSX. Therefore, the state configuration of the VSX pair changes in response to the failure condition:

• Primary VSX becomes the inactive appliance

• Secondary VSX becomes the active appliance

SRX LUNs, VSX pools, PVs, LVs and VSX LUNs are then available from the new active VSX.
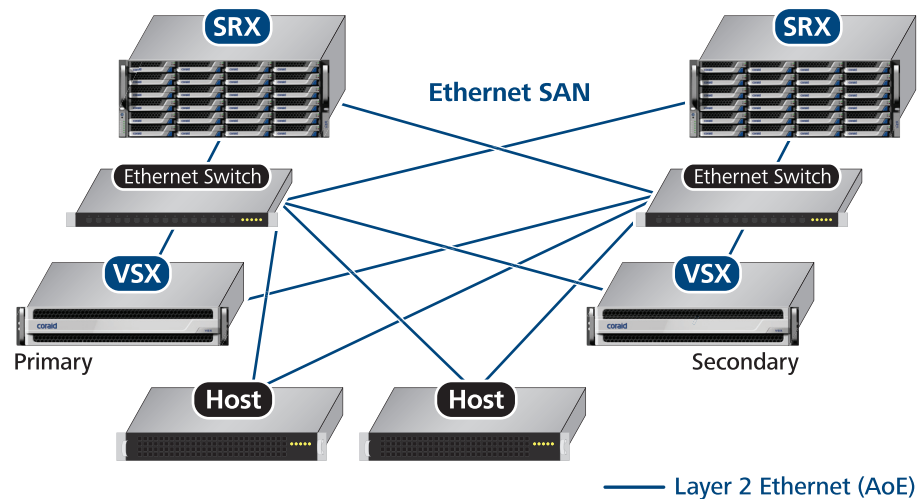
Figure 10: VSX High-availability/failover configuration with SRX mirroring

Once configured as primary and secondary, the VSX HA roles should not be changed. The HA state configuration (`hastate` command) determines which VSX services the SAN storage.

The secondary VSX monitors the primary VSX over the SAN connections (SAN address). If the secondary VSX is unable to communicate with the primary, or the primary becomes inactive, the secondary automatically switches to active mode.

Note: The secondary VSX may not be able to communicate with the primary VSX as a result of a failure on the secondary VSX SAN port(s), in which case:

• Both appliances run in active mode (i.e., the secondary is unable to instruct the primary to become inactive)

• The secondary VSX, even though it is in active mode, is unable to access storage

• The HA configuration is not functioning in high availability mode

Once the heartbeat port communication is restored, the secondary VSX will direct the primary VSX to become inactive. To restore the VSX appliances back to their original state configuration (primary as active and secondary as inactive), the active secondary VSX must relinquish control to the primary VSX. At the secondary VSX, use the hastate command to set the secondary VSX to inactive.

Make sure all SRX LUNs are online before the secondary VSX relinquishes control back to the primary VSX. Offline or missing SRX LUNs (i.e., `lost` is indicated in the STATE column of the `pvs` command output) during the fail back can cause those associated PVs to lose their VSX primary masks. If this occurs, you need to add VSX primary masks to the PVs manually using the SRX `mask` command.

Contact Coraid Technical Assistance Center if you need to replace either the primary or the secondary VSX appliance.

To configure the secondary VSX for HA

1. **Connect the secondary (backup) VSX to the SAN as you did the primary, described in Setting up the VSX.**

   Note: The secondary VSX monitors the primary via the SAN ports using a heartbeat signal. Make sure the SAN ports are connected properly during setup.

2. **Configure the time source and time zone as described in To set time zone and time source.**

   The primary and secondary VSX appliances must be configured to use the same time source.

3. **At the shelf prompt of the designated secondary VSX, type** `hapeers` **to get the SAN address (listed under** ADDRESS**) for the designated primary VSX.**

4. **Type** `harole` **to configure the role for the secondary VSX and make a connection to the primary VSX.**

   It is not necessary to set the primary role for the main VSX because primary is the default `harole` configuration. Once the primary and secondary VSX roles are configured they should not be changed.

   In the following example:

   - Primary VSX SAN address =51000013300a55ca

   - Secondary VSX SAN address =51000025500b55cb

   ```
   VSX shelf> harole -?
   usage: harole [ primary | secondary { address } ]
   VSX shelf> harole secondary 51000013300a55ca

   Setting role to secondary requires reboot and should
   only be done when both secondary and primary have been
   configured with the same ntp server.

   Enter 'y' for yes, 'n' for no. Continue? [n] y
   Role set to secondary protecting 51000013300a55ca for next
   boot,rebooting
   ```

5. **Allow the VSX to reboot and then log in to the secondary VSX again.**

6. **Type** `hastate` **to make sure the secondary VSX is configured to be inactive. For example:**

   ```
   VSX shelf inactive> hastate -?
   usage: hastate [ active | inactive ]
   VSX shelf inactive> hastate
   HASTATE
   inactive
   ```

   Note: When a VSX `hastate` is inactive, other VSX commands are disabled and the command prompt is displayed as: `VSX shelf inactive>`. The active VSX displays the assigned shelf address in the command prompt.

7. **Type** `hastatus` **to check the configuration.**

   At the secondary VSX prompt:

   ```
   VSX shelf inactive> hastatus
   HAROLE        HASTATE      PEER                     STATUS       HASTATE
   secondary     inactive     51000013300a55ca connected    active
   ```

   At the primary VSX prompt:

   ```
   VSX shelf> hastatus
   HAROLE        HASTATE      PEER                     STATUS       HASTATE
   primary       active       51000025500b55cb connected    inactive
   ```

   To verify that the failover is working properly, connect to the secondary VSX and set the hastate to active. The failover is successful if the primary VSX configuration (PVs, LVs, LUNs etc.) is available on the secondary VSX.

To break the connection between the HA pair

1. **At the shelf prompt of the designated secondary VSX, type** `harole primary` **to change the secondary VSX to primary.**

2. **At the reboot message select** `yes`**.**

3. **Type** `new` **at the following message:**

```
Would you like to retain the configuration for the primary
being protected or remove and start over with an empty
configuration?


Enter 'retain' to retain config, or 'new' to remove config.
? []
```

Note: Choosing `new` assumes you are strictly breaking the connection and not replacing the primary VSX. If the original primary VSX is still functioning, do not choose to `retain` the configuration on the secondary VSX as this will cause SAN problems.

Options are:

- `retain`—allows the secondary to keep the configuration of its former primary VSX

- `new`—removes all storage configuration from the secondary VSX

The secondary VSX automatically reboots.

To replace the primary VSX of an HA pair

Note: The following procedure assumes that the primary VSX has failed over to the secondary VSX (i.e., secondary VSX is `active`).

1. **Remove the failed primary VSX and install a new VSX appliance according to the installation instructions (Installing the VSX).**

2. **Set up the new VSX appliance with the same NTP server information as the original/ failed primary VSX, see Setting up the VSX.**

3. **At the shelf prompt of the secondary VSX, type** `harole` **and enter the SAN address of the new primary VSX.**

   If you do not know the SAN address, type hapeers to get the SAN address of the new primary VSX. You can also connect to the primary VSX and type sanaddr to get the SAN address.

   Since the secondary is active, the current configuration is transferred to the new primary.

4. **At the shelf prompt of the secondary VSX, use the hastate command to change the secondary VSX to inactive mode.**

```
VSX shelf> hastate -?
usage: hastate [ active | inactive ]
VSX shelf> hastate inactive
VSX shelf>
```

Shutting Down the VSX

To cleanly shut down a VSX appliance, always use the `halt` command prior to using the power button on the front panel. Issue `halt` when you intend to completely remove power from the appliance (such as prior to moving or servicing the appliance).

Note: Use the reboot command to clear temporary conditions when instructed by the Coraid Technical Assistance Center.

To shutdown the VSX and other appliances

1. **Quiesce any applications/hosts that are accessing VSX LUNs.**

2. **At the VSX prompt type the** `halt` **command and then power off the VSX using the button on the front panel.**

    The `halt` command stops the VSX service and halts the VSX.

    If you are shutting down a VSX HA pair, first halt and power off the *inactive* VSX before you shutdown the *active* VSX.

3. **Shutdown each SRX appliance using the** `halt` **command then the power button.**

    See the *SRX Administration Guide* for details.

    Note: If SRX appliances are not shutdown using the `halt` command, when restarted, SRX appliances will perform a parity validation on all RAID5 and RAID6 LUNs.

To power on the VSX and other appliances

1. **Power on each SRX appliance using the power button.**

    Confirm that all SRX LUNs are online.

2. **Power on the VSX appliance(s).**

    If you are powering on a VSX HA pair, first power up the *primary* VSX and make sure that all VSX LUNs are online. Then power on the *secondary* VSX and confirm the HA connection using the `hastatus` command (make sure it indicates `connected`). Powering on the *secondary* VSX first could cause the *secondary* VSX to assume the `active` state. To recover from this configuration, at the *primary* VSX prompt, type `hastate active`.

3. **Re-establish storage I/O from host systems.**

Updating the CorOS

See the *CorOS Update Addendum* for specific instructions on updating the CorOS and for information on updating the CorOS on a primary and secondary VSX in an HA configuration.

In general, you will need to do the following in order to update the VSX CorOS:

- Download the update file. If it is provided in zipped form, unzip it.

- Upload the update file to the VSX using `ftp` (file transfer protocol) or `scp` (secure copy).

- Access the VSX console or use `SSH` to connect to VSX.

- Issue the `update` command on the VSX.

- After the system reboots, `SSH` to the VSX again.

- Verify the release version.

VSX Command Reference

The commands in this section are available at the VSX console when you are directly connected to the VSX via the serial port or VGA/keyboard ports or over the network via an SSH client. Authenticated administrators can SSH to the IP address or DNS name of the configured VSX and then enter the user name and password information to access the VSX. SSH is enabled by default, but if it has been disabled, you have to enable it from the console login (see service). For example:

```
login as: admin
Sent username "admin"
admin@10.10.10.145's password:
VSX shelf>
```

Note: If an ssh-agent is enabled, a message will appear in the syslog indicating that there is an ssh public key login failure. The message is expected and can be ignored.

Most of these commands are for VSX management, not for management of storage appliances on the SAN. For information on specific commands used to manage storage appliances, see SRX documentation accessible from the Coraid web site www.coraid.com.

The following table lists the commands in alphabetical order for quick lookup. Click on the command to access more information.

aoediscover	hastate	mkpool	rmlun	shadowsend
aoeflush	hastatus	mkpv	rmlv	shelf
aoestat	help	model	rmpool	snap
applcon	ifstat	motd	rmpv	snaplimit
appldiscover	ipaddress	offline	rollback	snapsched
applflush	ipgateway	online	sanaddr	sos
applstat	logwatch	passwd	scpwipe	syslog
brkmirror	luns	ping	security	syslogtest
certhash	lviops	pools	serial	temp
clone	lvresize	power	series	timesource
clrhold	lvs	promote	service	timezone
clrsnapsched	lvsnaps	pviops	sethold	unmirror
date	lvstats	pvs	setmotd	unshadow
exit	lvthick	pvstats	setpoolmode	update
factoryreset	lvthin	readonly	setremote	uptime
fans	mask	readwrite	setsecurity	wstat
halt	mirror	reboot	setsnaplimit	
hapeers	mklun	release	setsnapsched	
harole	mklv	remote	shadowrecv	

Usage

Type any command followed by -? to print usage information. For example:

```
VSX shelf> ifstat -?
usage: ifstat [ -a ] [ interface ... ]
VSX shelf>
```

Also see the help command.

Command usage includes the following conventions:

- The -a flag displays all possible information for a command. Commands that use the -a convention are: aoestat, appldiscover, applflush, ifstat, lvs, lvsnaps, pools, pvs.

- A bracket [ ] surrounding an item indicates an optional item. If no bracket surrounds the input string, the item is mandatory. The arguments make the command more specific; many commands issued without an argument print current status or a general response.

- The ellipsis [...] indicates that more than one value may be entered as a range of sequential values. A dash (-) separates the ends of the sequence. See Range expansion.

- The curly bracket { } is used in conjunction with a vertical bar | to indicate cases where one of the specified options is required.

Some commands require confirmation before the command is executed. To complete the command enter yes (full word) or just Y when appropriate.

Note: Entering the # character in a command string is interpreted as the beginning of a comment and should be avoided.

Range expansion

The ellipsis [...] in command usage indicates a range option (series ranging), and can be of two types:

- Simple expansion—a single range is entered with a dash (-) separating the first and last item in the sequence. For example, 320.1-5 is interpreted as 320.1 320.2 320.3 320.4 320.5. A range can combine characters with incrementing numbers. For example: Athens0-5 is interpreted as Athens0 Athens1 Athens2 Athens3 Athens4 Athens5.

- Multiple or nested ranges may be expanded with a single command. For example, 0-2.1-3 is interpreted as 0.1 0.2 0.3 1.1 1.2 1.3 2.1 2.2 2.3

For long sequences, pad the first value with zero(s) so the incrementing number always has the same number of digits.

Examples of padding and multiple-range expansion are provided in the description of the **series** command, which allows you to test range expansion without executing a command.

Commands

◼ aoediscover

Sends a discovery message out over all SAN interfaces to discover new SRX LUNs. The `aoediscover` command prompts all SRX appliances to emit a signal to all other appliances to indicate their presence on the network.

Usage:

```
VSX shelf > aoediscover -?
usage: aoediscover
```

◼ aoeflush

The `aoeflush` command refreshes the list of AoE targets (LUNs) that display when the `aoestat` command is issued. It removes AoE targets (LUNs) that are no longer accessible from any SAN port and allows you to refresh the list of LUNs without having to reboot the VSX.

Usage:

```
VSX shelf > aoeflush -?
usage: aoeflush
```

◼ aoestat

Displays a list of all SRX LUNs and remote VSX LUNs on the SAN, total size of the LUN (GB), and VSX port access. By default this command lists all LUNs in numerical order.

Note: The VSX automatically handles load balancing across all available local interfaces and all available SRX ports for a given target LUN.

Usage:

```
VSX shelf> aoestat -?
usage: aoestat [-a -s] [target ...]
VSX shelf>
```

Command argument	Description
[-a]	Displays each SRX LUN/remote VSX LUN (target) in numerical order and includes the MAC address of each port that sees the SRX LUN, as well as the configuration string for the SRX LUN.
[-s]	Sorts SRX LUNs/remote VSX LUNs by size.
[target ...]	Enter a specific SRX LUN/remote VSX LUN or multiple LUNs to get information on the LUN size and the port being used for the target.

■ **applcon**

The `applcon` command establishes a connection to the console of a specified SRX shelf. To close the connection to the SRX shelf, type `exit` or `Ctrl-\ q` at the command line prompt.

Usage:

```
VSX shelf> applcon -?
usage: applcon shelf
VSX shelf>
```

■ **appldiscover**

The VSX appliance sends a discovery message out on all SAN interfaces to automatically discover new SRX appliances every 30 seconds. The `appldiscover` command forces the discovery message to be sent immediately.

Usage:

```
VSX shelf> appldiscover -?
usage: appldiscover [ -a ]
VSX shelf>
```

Command argument	Description
[-a]	The -a flag displays ether port status information which is often useful for Coraid Technical Support.

■ **applflush**

The `applflush` command refreshes the list of SRX appliances that display when the `applestat` command is issued. It removes stale SRX appliances from the list that are no longer accessible from any SAN port.

Usage:

```
VSX shelf> applflush -?
usage: applflush [ -a ] [ shelf ... ]
VSX shelf>
```

Command argument	Description
[-a]	The -a flag removes all SRX appliances from the list. The list will repopulate within 30 seconds
[shelf ...]	Enter a specific SRX shelf number or multiple SRX shelf numbers to remove from stale appliances from the list.

■ **applstat**

The `applstat` command displays all SRX appliances on the SAN. The display list can be restricted by providing one or more SRX shelf addresses. The status includes the SRX appliance shelf number, state of the appliance (`up`/`down`), and local port access.

Usage:

```
VSX shelf> applstat -?
usage: applstat [ shelf ... ]
VSX shelf>
```

■ **brkmirror**

The `brkmirror` command breaks I/O to the mirror target (i.e., I/O is no longer sent to the mirror target) but keeps the mirror relationship between the primary PV and mirror target in tact. The primary PV continues to operate as normal. `pvs` command `STATE` output is set to `broken`.

The `brkmirror` command disables automatic extent updates (i.e, automatic partial resilvering); issue the mirror command to update extents on the mirror target. Only the extents written since the `brkmirror` command was issued are copied to the mirror target.

The `brkmirror` command is typically used when upgrading CorOS on SRX appliances that have VSX mirrored targets.

Usage:

```
VSX shelf> brkmirror -?
usage: brkmirror PV [...]
VSX shelf>
```

Command argument	Description
PV [...]	Enter the PV (primary) or series of primary PVs (e.g., `7.6-9`) to stop I/O to the corresponding mirror target(s).

■ **certhash**

The `certhash` command returns the hash value of the certificate for the VSX. When setting up a shadow connection between two VSX appliances, the hash value is used in the setsecurity command to accept the certificate presented by the remote VSX. Each VSX has a unique private hash value and certificate.

```
VSX shelf> certhash -?
usage: certhash
VSX shelf>
```

■ **clone**

The `clone` command makes a read/write copy of an LV and saves it with a new name that you specify in the same pool as the original LV. No other LV characteristics (MAC mask, configuration string, shadow enable, VSX LUN) are included in the clone. Changes to either the original LV or clone LV are independent and do not affect the other. The name of the new cloned LV must be alphanumeric, no more than 16 characters, and must be unique across all pools. See Clone a logical volume or snapshot for more information.

Usage:

```
VSX shelf> clone -?
usage: clone orig_LV new_LV [...]
VSX shelf>
```

Command argument	Description
`orig_LV`	Enter the name of the LV you want to clone.
`new_LV [...]`	Enter the new name for the cloned LV. To create more than one cloned LV, enter the new name with a range of sequential integers. For example: `VSX shelf> clone Athens NYC0-3` The above command string creates four copies of the LV Athens at that precise time and saves it in the same pool with the names NYC0, NYC1, NYC2 and NYC3.

■ **clrhold**

The `clrhold` command disables the hold setting on a snapshot. Snapshots that have the hold setting disabled can be automatically removed. The hold setting for a snapshot is displayed using the lvsnaps command.

Usage:

```
VSX shelf> clrhold -?
usage:  clrhold LV.snap [...]
VSX shelf>
```

Command argument	Description

`LV.snap [...]`	Enter a specific VSX snapshot name or a series of sequentially numbered VSX snapshot names as a range indicated by a dash (-). This allows you to disable the hold setting on one or more snapshots.
	
	For example:
	
	`VSX shelf> clrhold Athens.1`
	
	`VSX shelf> clrhold Athens.1-7`

■ **clrsnapsched**

The `clrsnapsched` command clears a snapshot schedule assigned to one or more LVs. The setsnapsched command configures the snapshot schedule (also see the snapsched command for schedule information). Snapshots associated with that schedule instance no longer count against the schedule retain limit. If you create a new snapshot schedule using the same parameters of a previously cleared snapshot schedule (same `class` and `time`), any snapshots that were created previously are then inherited by the new schedule. Confirmation is required.

Command argument	Description
`class`	Enter one of the following parameters to identify the snapshot schedule you want to remove: hourly, daily, weekly, monthly or yearly.
`time`	Enter the `time` parameter for the snapshot schedule you want to remove. Enter the same time parameter configured using the `setsnapsched` command. For the following class types: • hourly (@mm)—enter the @ symbol and then a number between 0 to 59. For example: `@17`. • daily (@hh:mm)—enter the @ symbol and then a number based on a 24-hour clock (0-23). For example: `@22:17` • weekly (week@hh:mm)—enter the day of the week (`Sun`, `Mon`, `Tue`, `Wed`, `Thu`, `Fri`, `Sat`), an @ symbol and then a number based on a 24-hour clock (0-23). For example: `Tues@22:17` • monthly (day@hh:mm)—enter the day of the month (1-28), an @ symbol, and then a number based on a 24-hour clock (0-23). For example: `15@22:17` • yearly (mm.dd@hh:mm)—enter the month.day, an @ symbol, and then a number based on a 24-hour clock (0-23). For month enter one of the following: `Jan`, `Feb`, `Mar`, `Apr`, `May`, `Jun`, `Jul`, `Aug`, `Sep`, `Oct`, `Nov`, `Dec`. For example: `Jun.3@22:17`
`LV [LV ...]`	Enter a specific VSX LV name or a series of sequentially numbered VSX LV names as a range indicated by a dash (-). This allows you to remove a schedule on one or more LVs. The schedules must have the same parameters in order to remove multiple schedules. For example: `VSX shelf> clrsnapsched hourly @17 Athens`

Usage:

```
VSX shelf> clrsnapsched -?
usage: clrsnapsched class time LV [LV ...]
VSX shelf>
```

■ date

Displays current date and time. If an NTP server is configured time is maintained from the NTP source. Otherwise, time is maintained from the hardware clock set in the VSX BIOS.

Time zone defaults to Greenwich Mean Time (GMT) and may be configured using the timezone command.

Usage:

```
VSX shelf> date -?
usage: date
VSX shelf>
```

■ exit

The `exit` command terminates an active login to the VSX CLI.

Usage:

```
VSX shelf> exit -?
usage: exit
VSX shelf>
```

■ factoryreset

The `factoryreset` command resets the VSX to factory defaults, erasing all local configuration and destroying any data configuration. After clearing the configuration, the VSX reboots. Confirmation is required prior to erasing all configuration parameters.

Usage:

```
VSX shelf> factoryreset -?
usage: factoryreset
VSX shelf>
```

■ **fans**

The `fans` command reports the revolutions per minute (RPM) of each fan on the motherboard. A warning displays if one or more fans are missing. If the RPM indicates `0`, the fan may be disconnected or need to be replaced.

Usage:

```
VSX shelf> fans -?
usage: fans
VSX shelf>
```

Example:

```
VSX shelf> fans
FAN#      RPM
fan0     9375
fan1     9375
fan2     9375
fan3     9375
VSX shelf>
```

■ **halt**

The `halt` command stops the VSX service and halts the VSX. Once the VSX is halted, the user must press the power or reset button on the VSX front panel in order to restart the system.

Usage:

```
VSX shelf> halt -?
usage: halt
VSX shelf>
```

■ **hapeers**

The `hapeers` command displays a list of VSX appliances accessible on the SAN. The following information is displayed:

Column	Description
SHELF	Displays the shelf name of VSX appliances accessible on the SAN.
ADDRESS	Displays the SAN address of the VSX appliance. This address is used in harole command to configure HA connection.
MODEL	Displays the VSX model name

Usage:

```
VSX shelf> hapeers -?
usage: hapeers
VSX shelf>
```

Also see sanaddr.

■ **harole**

The `harole` command defines whether a particular VSX is the primary (main) or secondary (backup) appliance in an HA configuration. In a single VSX configuration, the VSX is set to primary by default and should not be changed to secondary. In a fault-tolerant HA environment, consisting of two VSX appliances, one appliance is the primary and its default settings do not need to be changed, while the other appliance (backup) needs to be configured as the secondary appliance. The secondary VSX monitors the primary over the SAN connection(s). If the SAN connection(s) fails or the primary itself becomes inactive, the secondary becomes active (see the hastate command) and serves the SAN storage.

The `harole` command without any arguments returns configuration information.

Usage:

```
VSX shelf> harole -?
usage: harole [ primary | secondary { address } ]
VSX shelf>
```

Command argument	Description
`[primary	secondary { address }]`	You do not need to configure the primary (main) appliance of the pair because it is set to primary by default. If you are configuring the VSX to be the backup or secondary appliance of the pair, type secondary and then the SAN address of the primary VSX (from the secondary VSX use the hapeers command to get the SAN address of the primary VSX).

See To configure the secondary VSX for HA for a usage example.

■ **hastate**

The `hastate` command defines whether the VSX is configured as active or inactive. In a single VSX configuration, the VSX is active by default and should not be changed to inactive. In a fault-tolerant HA configuration, the primary VSX default configuration is active and the secondary VSX is configured to be inactive. The VSX set to active (primary or secondary) is responsible for servicing the SAN storage.

During normal operation, the secondary VSX is inactive and monitors the active, primary VSX. If the secondary VSX is unable to communicate with the primary via the SAN connection(s), or the primary becomes inactive, the secondary switches to active mode automatically. Once the secondary becomes active, set the secondary VSX inactive to relinquish control back to the primary VSX (i.e., return to a fault tolerant configuration). If the primary connection is unavailable, the secondary cannot be set to inactive mode.

The `hastate` command without any arguments returns configuration information.

Usage:

```
VSX shelf> hastate -?
usage: hastate [ active | inactive ]
VSX shelf>
```

See To configure the secondary VSX for HA for more information.

■ **hastatus**

The `hastatus` command displays configuration details for a high-availability (HA) VSX pair. The information displayed includes:

Column	Description
HAROLE	Indicates whether the VSX you are connected to is configured to be the primary (main) or secondary (backup) VSX of the pair.
HASTATE	Indicates whether the VSX you are connected to is active or inactive.
PEER	On the primary VSX—indicates the SAN address of the VSX configured as secondary.
	On the secondary VSX—indicates the SAN address of the VSX configured as primary.
STATUS	Indicates whether the VSX pair is connected or disconnected.
HASTATE	On the primary VSX—indicates whether the current state of the secondary VSX is active or inactive.
	On the secondary VSX—indicates whether the current state of the primary VSX is active or inactive.
	Note: `unknown` may be reported if one of theVSX appliances loses connection with the other VSX appliance.

Usage:

```
VSX shelf> hastatus -?
usage: hastatus
VSX shelf>
```

See High-availability Configuration for a more information.

■ **help**

Displays a list of all VSX commands in alphabetical order.

Usage:

```
VSX shelf> help -?
usage: help [ -s ] [ cmd ... ]
VSX shelf>
```

Command argument	Description
[-s]	Displays the command list with a brief description of each command.
[cmd ...]	Provides more detailed information and usage about a particular command.

■ **ifstat**

The `ifstat` command displays the status of all local interface ports. The MAC address and link speed are also displayed. Without an argument, `ifstat` lists all local interface ports.

Usage/example:

```
VSX shelf> ifstat-?
usage: ifstat [ -a ] [ interface ... ]
VSX shelf> ifstat
NAME            ADDR    LINK (Mbps)
ether0   000450080044    1000/1000
ether1   000450080045       0/1000
ether2   0004500a4b56   10000/10000
ether3   0004500a4b57       0/10000
ether4   0004500a4b7c       0/10000
ether5   0004500a4b7d       0/10000
VSX shelf>
```

Command argument	Description
`[-a]`	Displays additional statistics about the interface(s).
`[ interface ... ]`	Displays the MAC address and link speed for that particular port. For example, `ifstat ether0` would only display information for the ether0 port.

Note: If the VSX has speed or performance issues, use `ifstat` to check the link speed. Check cable connections to the VSX and to the SAN to ensure that connections have not come loose.

■ **ipaddress**

To configure the IP address and subnet mask for VSX port ether0, type the command then the port, and then the IP address and subnet mask.

ipaddress without any arguments displays the VSX IP address(es) and subnet mask.

Note: ether1 is currently reserved to connect to an isolated communications network in 10GbE SAN configurations that include the ESM. Do not set the ether1 IP address.

Usage:

```
VSX shelf> ipaddress -?
usage: ipaddress [ { ether0 | ether1 } address mask ]
VSX shelf>
```

Command argument	Description
{ether0	ether1}	Enter ether0 and then the IP address to configure the IP address for port ether0.
[address mask]	Enter the address for the subnet mask.

Example:

```
VSX shelf> ipaddress ether0 10.10.10.145  255.255.255.0
VSX shelf>
```

■ **ipgateway**

ipgateway without any arguments displays the VSX IP gateway address.

To configure the IP route/gateway address for the VSX, enter the command and then the IP address for the gateway.

Usage:

```
VSX shelf> ipgateway -?
usage: ipgateway [ gateway ]
VSX shelf>
```

■ **logwatch**

When you are connected to the appliance via SSH, the logwatch command is used to display new syslog messages to the screen as they occur. Since new syslog messages are automatically displayed to the screen when connected to the console, the logwatch command is only applicable when connected via SSH. Type <Ctrl-C> to exit from the command.

Usage:

```
VSX shelf > logwatch -?
usage: logwatch
VSX shelf >
```

■ **luns**

The luns command displays a list of all VSX LUNs, or only the specified VSX LUNs, and their status. The information displayed includes:

Column	Description
LUN	Displays the VSX LUN (shelf.lun).
STATUS	Displays whether the VSX LUN is online or offline.
LV	Displays the associated LV name.
SIZE(GB)	Displays capacity of the VSX LUN/LV in Gigabytes.
MODE	• r/w—indicates that the LV is read/write. • r/o—indicates that the LV is read only.
MASKS	Indicates the number of MAC masks that have been configured. If no MAC masks have been configured, 0 is indicated.

Usage:

```
VSX shelf> luns -?
usage: luns [LUN ...]
VSX shelf>
```

Command argument	Description
[LUN ...]	Enter a specific VSX LUN or a series of sequentially numbered VSX LUNs as a range indicated by a dash (-). This allows you to select specific LUN(s) instead of all VSX LUNs.

■ **lviops**

The `lviops` command displays the Input/Output operations per second (IOPS) for a specified LV. IOPS of 512 bytes, 1024 bytes, 2048 bytes, 4096 bytes, 8192 bytes, and operations greater than 8192 bytes are displayed for reads and writes to a particular LV. If a frame falls between two sizes, the larger size increments. For instance, a transaction of 4608 bytes would increment the 8192 byte counter.

Usage:

```
VSX shelf> lviops -?
usage: lviops [-s seconds] [LV ...]
VSX shelf>
```

Command argument	Description
`[-s seconds]`	Enter `-s` and a number between 1 and 30 to specify the prior time period in seconds for calculated LV IOPS statistics. If no value is specified, the default value is 4 seconds.
`[LV ...]`	Specify the name of the LV or a series of LVs whose statistics you want to access. For a series of LVs, indicate the range using a dash (-). For example: `VSX shelf> lviops  Athens1-10.`

■ **lvresize**

The `lvresize` command can be used to increase the size of a logical volumes (LVs). The size of the LV must be entered in decimal form with a T, G, M or K suffix to indicate the size in Terabytes, Gigabytes, Megabytes, or Kilobytes, respectively. If no suffix is specified, the number specified is interpreted as a byte count. New extents are allocated from the pool to increase the size of the LV.

Make sure your filesystem supports increasing the size of an LV before using the `lvresize` command.

```
VSX shelf> lvresize -?
usage: lvresize size[T,G,M,K] LV [...]
VSX shelf>
```

Command argument	Description
`size[T,G,M,K]`	Enter the new amount of space you want to allocate to the LV.
	The size of the LV must be entered in decimal form with `T`, `G`, `M` or `K` after the number to indicate the size in Terabytes, Gigabytes, Megabytes, or Kilobytes respectively. If no letter is specified, the number is interpreted as a byte count.
`LV [...]`	Specify the name of the LV or a series of LVs that you want to change. To change multiple LVs to the same size, enter the LV series differentiated by numbers. Indicate the range using a dash (-). For example:
	`VSX shelf> lvresize 200G Athens1-10.`

■ **lvs**

The lvs command displays information about all VSX LVs. The information displayed includes:

Column	Description
LV	Displays the LV name of all LVs in all defined pools.
SIZE (GB)	Total capacity of the LV in Gigabytes.
MODE	• r/w—indicates that the LV is read/write. • r/o—indicates that the LV is read only.
LUN	Indicates the VSX LUN if a LUN has been assigned using the mklun command.
POOL	Name of the pool that includes the LV.
PROV	Indicates thin for thinly provisioned LVs and thick for LVs that are *not* thinly provisioned.
SHADOW	If shadow replication is enabled one of the following is displayed: • recv—indicates that the LV is designated as the shadow target LV. • send—indicates that the LV is designated as the shadow source LV.
STATE	State can be: • healthy—indicates that all PVs that contribute extents to the LV are available and on the SAN. • suspended—indicates that one or more PVs that contribute extents to the LV are no longer available on the SAN.

Usage:

```
VSX shelf> lvs -?
usage: lvs [-a] [LV ...]
VSX shelf>
```

Command argument	Description
[-a]	In addition to the information above, the `[-a]` flag displays: • Total Extents (total number of extents needed to contain the LV) • Dirty Extents (extents updated since the LV was created, or since the last snapshot was taken) • Thin Extents (extents that have not been written/allocated) • PV Extents (PVs that have contributed extents to the LV) • Creation time and date of the LV • Serial number of the LV • MAC mask addresses set for the LV • Reservations (displays reserved MAC address) • Shadow (provides shadow replication information for the LV on the other side of the shadow connection).
[LV ...]	Enter a specific LV or a series of sequentially numbered LVs as a range indicated by a dash (-). This allows you to select specific LV(s) instead of all LVs.

■ **lvsnaps**

The lvsnaps command displays information about VSX snapshots. The information displayed includes:

Column	Description
SNAPSHOT	Displays the LV snapshot name in all defined pools.
DATE	Displays the snapshot creation date in the format: Year, Month, Day. Hour, Minute, Second For example, 20121030.214002 represents: 2012 October 30 . 2100 (9 pm) 40 minutes and 2 seconds.
SIZE(GB)	Size of the snapshot in Gigabytes.
CLASS	Displays manual for snapshots taken using the snap command or displays one of the following for scheduled snapshots: hourly, daily, weekly, monthly, yearly.
SCHEDULE	Indicates the time parameter set for the schedule instance using the setsnapsched command.
HOLD	Displays enabled or disabled (also see Snapshot hold setting).

Usage:

```
VSX shelf> lvsnaps -?
usage: usage: lvsnaps [ -s -a ] [LV] [LV.snap] [...]
VSX shelf>
```

Command argument	Description
-s	Displays snapshots in order of the schedule instance.
-a	Displays the pool that each snapshot resides in as well as extent details for each snapshot. This information is often useful for Coraid Technical Assistance Center.
[LV]	Enter a specified LV to get a list of all snapshots generated for the specified LV.
[LV.snap]	Enter the name of a particular snapshot to get information for that particular snapshot.
[...]	Enter multiple sequentially numbered LVs as a range indicated by a dash (-) or the names of multiple LV snapshots separated by a space. This allows you to get information for more than one LV snapshot at a time.

■ **lvstats**

The lvstats command displays the I/O statistics for an LV. The MB/second, average latency and maximum latency for reads and writes are displayed. The lvstats command allows you to see what LV has the most read/write activity.

Usage:

```
VSX shelf> lvstats -?
usage: lvstats [-s seconds] [LV ...]
```

Command argument	Description
[-s seconds]	Enter -s and a number between 1 and 30 to specify the prior time period in seconds for the calculated statistics. If no value is specified, the default value is 4 seconds.
[LV ...]	Specify the name of the LV or a series of LVs whose statistics you want to access. For a series of LVs, indicate the range using a dash (-). For example: VSX shelf> lvstats Athens1-10.

■ **lvthick**

The lvthick command changes thin provisioned LVs into thick provisioned LVs. For each thin extent in the LV an actual extent in the pool is allocated. The command fails if the number of thin extents in the LV is greater than the number of free extents in the pool.

Usage:

```
VSX shelf> lvthick -?
usage: lvthick LV [...]
VSX shelf>
```

■ **lvthin**

The lvthin command changes thick provisioned LVs into thin provisioned LVs. Extents that have been allocated, but not used, are freed.

```
VSX shelf> lvthin -?
usage: lvthin LV [...]
VSX shelf>
```

Also see mklv.

■ **mask**

The mask command displays MAC address masks for all LVs with at least one configured mask. The display list can be restricted by providing one or more LV arguments. The displayed status includes LV name, assigned VSX LUN, and mask list.

The mask command also allows you to modify MAC mask lists at the LV level in order to control the way VSX LUNs are presented to initiators. VSX MAC masks are not propagated across clones and snaps; they must be set explicitly for each LV.

When adding or removing a MAC address:

- Prefix the MAC address with a plus (+) to add the MAC address

- Prefix the MAC address with a minus (-) to remove the MAC address

Usage:

```
VSX shelf> mask -?
usage: mask [{+|-}mac ...] [LV ...]
VSX shelf>
```

Command argument	Description
[{+|-}mac ...]	Enter a + (plus) and then the MAC address for each MAC mask you want to add, or a - (minus) and then the MAC address for each MAC mask you want to remove.
[LV ...]	Specify the name of the LV or a series of LVs that you want to mask.

The luns command displays the number of masks set for VSX LVs.

■ **mirror**

The `mirror` command establishes a mirror relationship between a PV and an SRX LUN. The specified mirror target cannot be an SRX LUN that is already in use (as a SRX LUN, PV, shadow target, or another mirror target). Use the `aoestat` and `pvs` commands to get a list of available SRX LUNs and already committed PVs.

The mirror target must be of equal or greater size than the source PV. You can mirror:

• One PV to one SRX LUN (`to` is not required in the command usage)

• More than one PV to more than one SRX LUN (the keyword `to` is used between the two ranges). You must have the same number of PVs and targets in the series, otherwise an error is indicated.

For information on mirror status, see `STATE` in the pvs command.

Usage:

```
VSX shelf> mirror -?
usage: mirror PV [... to] target [...]
VSX shelf>
```

Command argument	Description
`PV [... to]`	Enter the PV or a PV series that you want to mirror. For a PV series, indicate a range of PVs using a dash (-), followed by to. For example, `7.6-9 to`. (Because both PVs and SRX LUNs use the `shelf.lun` format, to is used to distinguish between the two series.)
`target [...]`	Enter the SRX LUN or a series of LUNs as the other half of the mirrored pair. For an SRX LUN series, use a dash (-) to indicate a range of LUNs. For example, `20.6-9`.

Example:

```
VSX shelf> mirror 7.5 20.5
```
-or-
```
VSX shelf> mirror 7.6-9 to 20.6-9
```

■ **mklun**

The `mklun` command assigns a VSX LUN (`shelf.lun`) to an LV. Only one VSX LUN can be assigned to an LV. When using the `mklun` command, the LUN is entered in a `shelf.lun` format. The `shelf` portion of `shelf.lun` must use the VSX base shelf address or a number within 15 digits of the VSX base shelf address. For example, if the VSX base shelf address is 320, the `shelf` portion of `shelf.lun` must be a number between 320-335. The `lun` portion of `shelf.lun` must be a number between 0-254 inclusive. A total of 4,080 simultaneous online LUNs can be created per VSX appliance.

Also see To make the LV available to initiators.

Usage:

```
VSX shelf> mklun -?
usage: mklun LV [... to] LUN [...]
VSX shelf>
```

Command argument	Description
`LV [... to]`	Enter an LV or an LV series that you want to assign a VSX LUN. For an LV series indicate the LV range using a dash (-), followed by `to`. For example, `Athens0-3 to`. (to is used to separate the LV and VSX LUN ranges.)
`LUN [...]`	Enter `shelf.lun` or a series of `shelf.luns` to assign VSX LUN(s) to an LV. For a series, indicate the LUN range using a dash (-). For example, `330.0-3`. There must be the same number of LVs and VSX LUNs in the series; otherwise, an error is indicated.

■ **mklv**

The mklv command creates a read/write logical volume (LV) from a specified pool. You specify the pool, the size of the LV, and the name. By default data extents are immediately allocated from the PVs in the pool. The optional flag -t allows you to create a thinly provisioned LV (i.e, data extents are allocated as needed).

Usage:

```
VSX shelf> mklv -?
usage:  mklv [-t] pool size[T,G,M,K] name [...]
VSX shelf>
```

Command argument	Description
[-t]	Enter the -t flag to create a thinly provisioned LV. **Thinly provisioned LVs:** When an LV is set for thin provisioning it means that the physical storage is only dedicated to the LV when application data is actually written and not when the LV is initially created. Servers and applications view a full size LV but the storage is only allocated when the storage blocks are required for writing data.
pool	Enter the name of the pool used to allocate extents to the LV.
size[T,G,M,K]	Enter the amount of space you want to allocate to that LV. The size of the LV must be entered in decimal form with T, G, M or K after the number to indicate the size in Terabytes, Gigabytes, Megabytes, or Kilobytes respectively. If no letter is specified, the number is interpreted as a byte count.
name[...]	Enter the name you want to assign to the LV. The LV name must be unique across pools, alphanumeric, and limited to 16 characters. You can add multiple LVs of the same size all at once using the same name differentiated by numbers. Indicate the range using a dash (-). For example: `VSX shelf> mklv sales 100G Athens1-10.`

Also see lvthick and lvthin.

■ **mkpool**

The `mkpool` command creates an empty pool on the VSX with a unique name. The pool name must be alphanumeric and is limited to 16 characters. The pool stores PVs and LVs. The LV data extent allocation mode is set to concatenated (`concat`) by default for the pool. If the pool is set to `concat`, extents are allocated to the LV from the first PV that has enough extents. Additionally, when a thick LV is created, the PV that has the most free extents is used; when a thin LV is created, the PV that holds the metadata is used for extents.

A total of 32 pools can be created per VSX appliance.

Note: See setpoolmode for information on changing the extent allocation mode for the pool.

 Usage:

```
VSX shelf> mkpool -?
usage: mkpool name [...]
VSX shelf>
```

Command argument	Description
`name [...]`	Enter the name you want to assign to the pool. You can add multiple pools all at once using the same name differentiated by a range of numbers. Indicate the range by a dash (-). For example, `mkpool sales1-4` would create four pools named `sales1`, `sales2`, `sales3` and `sales4`. You can also enter multiple pool names separated by a space.

Example:

```
VSX shelf> mkpool sales
VSX shelf> pools
POOL    #PVs   TOTAL(GB)    FREE(GB)    USED(%)    MODE
sales    0      0.000        0.000           0    concat
```

-or-

```
VSX shelf> mkpool sales1-4
VSX shelf> pools
POOL    #PVs   TOTAL(GB)    FREE(GB)    USED(%)    MODE
sales1   0      0.000        0.000           0    concat
sales2   0      0.000        0.000           0    concat
sales3   0      0.000        0.000           0    concat
sales4   0      0.000        0.000           0    concat
```

■ **mkpv**

The mkpv command formats an available SRX LUN as a PV adding its extents to the unallocated (free) space of a pool. You can add a total of 128 PVs to a single pool.The specified pool must already exist.

When adding SRX LUN (target) to the pool, make sure they are all of the same RAID type and include the same number of hard disk drives within that RAID type.

See Disk properties and SRX LUN properties before formatting an SRX LUN as a PV and adding it to a pool.

If the LUN is allocated to another pool an error is reported when you try to add it to a new pool: error: [target x] already in use

Usage:

```
VSX shelf> mkpv -?
usage: mkpv pool target [...]
VSX shelf>
```

Command argument	Description
pool	Enter the name of the pool to which you want to add the SRX LUN.
target [...]	Specify the SRX LUN (target) you want to add to the pool. If the target includes multiple LUNs in a numbered sequence, you can add multiple targets to the pool all at once using a dash (-) to indicate the range (see the second example below).You can also add multiple, non-consecutive PVs to a pool using a space between PVs (e.g., mkpv mktg 7.6 7.8).

Examples:

```
VSX shelf> mkpv sales 7.5
VSX shelf> mkpv mktg 7.6-9
```

■ **model**

Displays the VSX model name.

Usage:

```
VSX shelf> model -?
usage: model
VSX shelf>
```

■ **motd**

The motd command displays the current banner message configured using the setmotd command.

Usage:

```
VSX shelf> motd -?
usage: motd
VSX shelf>
```

■ **offline**

The offline command disables SAN access for one or more specified VSX LUN(s).

Usage:

```
VSX shelf> offline -?
usage: offline LUN [...]
VSX shelf>
```

Command argument	Description
LUN [...]	Enter a specific VSX LUN or a series of sequentially numbered VSX LUNs as a range indicated by a dash (-). This allows you to restrict network access to more than one VSX LUN at a time.

Note: All VSX LUNs must be placed offline to change the VSX base shelf address.

■ **online**

The online command enables SAN access for one or more VSX LUNs.

Usage:

```
VSX shelf> online -?
usage: online LUN [...]
VSX shelf>
```

Command argument	Description
LUN [...]	Enter a specific VSX LUN or a series of sequentially numbered VSX LUNs as a range indicated by a dash (-). This allows you to place more than one VSX LUN online at a time.

■ passwd

The passwd command sets the administrator login password. The VSX is shipped with the default password admin. The password cannot be longer than 27 characters.

Usage:

```
VSX shelf> passwd -?
usage: passwd
VSX shelf>
```

Example:

```
VSX shelf> passwd
old password: *****
new password: ********
again to verify: ********
VSX shelf>
```

Note: If the administrator loses the password given to the VSX appliance, entering the reserved keyword ivelostit at the *console* login begins a challenge/response dialogue which requires that the administrator contact Coraid Technical Assistance Center for a response. After successful completion of the challenge/response, the password is reset to the factory default (admin).

Recovery example:

```
Coraid VSX
Copyright (c) 2011 Coraid, Inc
All Rights Reserved
Admin Password: *********
challenge: 25250
response:
```

■ **ping**

The `ping` command sends an Internet Control Message Protocol (ICMP) echo request message to a specified IP address. `ping` is used to determine whether or not the destination at the specified IP address is reachable and to measure network latency. Three ping requests are sent to the specified IP address and 3 responses are returned to the VSX. Information for each returned response (`0-2`) includes:

• Round trip time for the request (`rtt`)

• Average round trip time (`avg rtt`)

• Time-To-Live (`ttl`)

 If the destination is not reachable, `lost` is indicated in the response.

Note: In order to display the response output properly, make sure the UTF-8 unicode character set is enabled in your SSH client.

Usage:

```
VSX shelf> ping -?
usage: ping IPaddress
VSX shelf>
```

▪ pools

The `pools` command displays details about VSX configured pools. If a name is specified, it displays details about that specific pool, or if no pool name is entered, it displays details about all pools configured on the VSX.

Column	Description
POOL	Displays the name of all pools created on the VSX appliance.
#PVs	Displays the number of PVs that have been added to a pool.
TOTAL(GB)	Total capacity of the pool in Gigabytes.
FREE (GB)	Unallocated free space in the pool.
USED (%)	The percentage of the pool used.
MODE	Extent allocation mode (`concat` or `striped`). Default setting is `concat` but the configuration can be changed using the setpoolmode command.

Usage:

```
VSX shelf> pools -?
usage: pools [-a] [pool ...]
VSX shelf>
```

Command argument	Description
[-a]	Displays additional information about PVs and LVs and the total and free extents often useful for Coraid Technical Assistance Center.
pool [...]	Enter the name of a specific pool or a series of pools for information about the specified pool(s).

■ **power**

The power command displays the status, temperature, and fan RPM for all power supplies in the appliance. If a power supply is not found, it is reported as missing.

Note: Complete status reporting is available only on VSX appliances that include power supply monitoring hardware. Older VSX appliances that do not include the power supply monitoring hardware return the message No power supply is reporting failure.

Usage:

```
VSX shelf> power -?
usage: power
VSX shelf>
```

Example:

```
VSX shelf> power
PSU#    STATUS  TEMP   FAN1RPM
ps0         up   28C      7213
ps1    missing
VSX shelf>
```

■ **promote**

The promote command promotes the SRX LUN (mirrored target) to the primary PV, essentially switching the order of the mirror connection. This is useful for taking an SRX LUN out of service. After exchanging PV target roles, the unmirror command may be used to remove the original PV now configured as the mirror target.

Usage:

```
VSX shelf> promote -?
usage: promote mirrorTarget [...]
VSX shelf>
```

Command argument	Description
mirrorTarget [...]	Enter the SRX LUN (target) or series of target LUNs (e.g., 20.6-9) that you want to promote to the primary PV(s).

■ **pviops**

The `pviops` command displays the Input/Output operations per second (IOPS) for a specified PV. IOPS of 512 bytes, 1024 bytes, 2048 bytes, 4096 bytes, 8192 bytes, and operations greater than 8192 bytes are displayed for reads and writes to a particular PV. If a frame falls between two sizes, the larger size increments. For instance, a transaction of 4608 bytes would increment the 8192 byte counter.

Usage:

```
VSX shelf> pviops -?
usage: pviops [-s seconds] [PV ...]
```

Command argument	Description
[-s seconds]	Enter -s and a number between 1 and 30 to specify the prior time period in seconds for the calculated PV IOPS statistics. If no value is specified, the default value is 4 seconds.
[PV ...]	Specify the name of the PV or a series of PVs whose statistics you want to access. For a series of PVs, indicate the range using a dash (-). For example: `VSX shelf> pviops  7.5-9.`

■ **pvs**

The pvs command displays information about all VSX PVs. The information displayed includes:

Column	Description
PV	PV in the form of shelf.lun.
TOTAL(GB)	Total capacity of the PV in Gigabytes.
FREE(GB)	Unallocated free space in Gigabytes.
MIRROR	SRX LUN assignment of the mirror. If a mirror connection is configured, the data is copied to the primary PV and the mirror target.
STATE	• single—the indicated PV does not have mirroring configured. • single-lost—the PV is no longer available on the SAN. • mirrored—the primary PV and mirror are in sync; PV is fault tolerant. • mirrored-lost—the mirrored PV and the mirrored target are no longer available on the SAN. • silvering —extents from the primary PV are being copied to the mirror target. • silvering-lost —the PV is no longer available on the SAN. Silvering is the last known state. • broken—mirroring has failed; mirror is now out of sync. (Use the mirror command to rebuild the broken mirror.) • broken-lost—the PV is no longer available on the SAN. The mirror has failed and broken is the last known state. • missing—the mirrored target cannot be loaded.
POOL	Name of the pool that includes the PV.

Usage:

```
VSX shelf> pvs -?
usage: pvs [-a] [PV ...]
VSX shelf>
```

Command argument	Description
[-a]	In addition to the information above, the [-a] flag displays: • Total Exts (total PV extents) • Free Exts (PV extents that are available) • Used Exts (extents that have been used by an LV) • Dirty Exts (extents that have been updated since breaking a mirror) • Meta Exts (LV metadata extents on the PV) • Created (date the PV was created)
[PV ...]	Enter a specific PV or a series of sequentially numbered PVs as a range indicated by a dash (-). This allows you to view information about specific PV(s) instead of all PVs.

Example:

```
VSX shelf> pvs
PV           TOTAL(GB)     FREE(GB) MIRROR      STATE       POOL
7.5          1000.205      900.165              single      sales
7.6          1000.205      900.165              single      mktg
7.7          1000.205      900.165              single      mktg
7.8          1000.205      900.165              single      mktg
7.9          1000.205      900.165              single      mktg
```

■ pvstats

The `pvstats` command displays the I/O statistics for a PV. The MB/second, average latency and maximum latency for reads and writes are displayed. The `pvstats` command allows you to see what PV has the most read/write activity.

Usage:

```
VSX shelf> pvstats -?
usage: pvstats [-s seconds] [PV ...]
```

Command argument	Description
`[-s seconds]`	Enter `-s` and a number between 1 and 30 to specify the prior time period in seconds for the calculated statistics. If no value is specified, the default value is 4 seconds.
`[PV ...]`	Specify the name of the PV or a series of PVs whose statistics you want to access. For a series of PVs, indicate the range using a dash (-). For example: `VSX shelf> pvstats 7.5-9.`

■ readonly

The `readonly` command sets LV access to read-only (r/o). Enter the name of the LV or a series of LVs whose read/write mode you want to change. An LV in read-only mode does not accept writes to its assigned VSX LUN when presented on the SAN.

For a series of sequentially numbered LVs, indicate the range by using a dash (-). Use the `lvs` command to get the current read/write status of the LV.

Usage:

```
VSX shelf> readonly -?
usage: readonly LV [...]
VSX shelf>
```

■ readwrite

The `readwrite` command sets LV access to read/write (r/w). Enter the name of the LV or a series of LVs whose read/write mode you want to change. An LV in read/write mode accepts writes to its assigned VSX LUN when presented on the SAN. Confirmation is required.

For a series of sequentially numbered LVs indicate the range by using a dash (-). Use the `lvs` command to get the current read/write status of the LV.

Usage:

```
VSX shelf> readwrite -?
usage: readwrite LV [...]
VSX shelf>
```

■ **reboot**

The reboot command shuts down the VSX core service and reboots the VSX appliance.

Usage:

```
VSX shelf> reboot -?
usage: reboot
VSX shelf>
```

■ **release**

The release command displays the current version of the CorOS.

Example:

```
VSX shelf> release
VSX-1.X.X
VSX shelf>
```

■ **remote**

The remote command lists the remote name, called the RNAME, assigned to the remote VSX and its associated IP address(es). The RNAME is assigned using the setremote command and is required for shadow replication.

If the remote VSX is part of an HA pair, the remote command lists both the primary and secondary VSX IP addresses associated with the assigned RNAME.

Without an argument, the remote command lists all remote names (RNAME) and associated IP addresses.

Usage:

```
VSX shelf> remote -?
usage: remote [ RNAME ] [ ... ]
VSX shelf>
```

Command argument	Description
[RNAME] [...]	Enter a specific RNAME for the remote VSX or a series of RNAME(s) to get IP address information. For a series of RNAMEs, indicate the range using a dash (-). For example: `VSX shelf> remote VSXtarget0-3.`

■ **rmlun**

The `rmlun` command disassociates one or more VSX LUNs from the associated LV. The VSX LUN must first be placed offline before it can be removed.

Usage:

```
VSX shelf> rmlun -?
usage: rmlun LUN [...]
VSX shelf>
```

Command argument	Description
`LUN [...]`	Enter a specific VSX LUN or a series of sequentially numbered VSX LUNs as a range indicated by a dash (-). This allows you to remove more than one VSX LUN at a time.

■ **rmlv**

The `rmlv` command removes a specified LV or a series of LVs from the VSX, returning unassigned extents to the unallocated (free) space of the pool. Also use this command when you want to remove LVs created using the `snap`, or `clone` commands or snapshots created as part of an automated snapshot schedule. Confirmation is required before the command is executed. Confirmation options include:

`n`—cancels the operation.

`a`—deletes all LVs in the specified series without further confirmation.

`y`—deletes the current LV listed in the dialog and requires additional confirmation for the next LV in the series.

You need to remove any VSX LUNs or snapshots associated with the LV before you can remove the LV. Removing an LV results in loss of data unique to that LV.

Note: If the LV is configured for shadow replication, you will need to break the shadow connection to remove the latest snapshot in the series (see unshadow).

Usage:

```
VSX shelf> rmlv -?
usage: rmlv LV [...]
VSX shelf>
```

Command argument	Description
`[LV ...]`	Enter a specific LV/snapshot or a series of sequentially numbered LVs/snapshots as a range indicated by a dash (-). This allows you to select more than one LV/snapshot at a time.

■ **rmpool**

The `rmpool` command removes one or more pools from the VSX. In order to remove a pool, you need to do the following for any elements associated with the pool:

In associated pool:	Use command:
• Offline VSX LUNs	`offline`
• Remove VSX LUNs	`rmlun`
• Remove snapshots associated with LVs **Note:** If the LV is configured for shadow replication, break the shadow connection to remove the last common snapshot in the series (see unshadow).	`rmlv`
• Remove LVs	`rmlv`
• Remove PVs	`rmpv`

In other words, the pool must be empty before you can remove it. If the pool is not empty and you try to remove it an error is reported.

Usage:

```
VSX shelf> rmpool -?
usage: rmpool pool [...]
VSX shelf>
```

Command argument	Description
`pool [...]`	Enter the name of the pool or a series of pools that you want to remove.

■ **rmpv**

The `rmpv` command allows you to remove one or more PVs from their associated pool. A PV is an SRX LUN (`shelf.lun`) formatted as a PV and added to a VSX pool. Before a PV can be removed:

Action:	Use command:
• Offline VSX LUNs	**offline**
• Remove VSX LUNs	**rmlun**
• Remove snapshots associated with LVs	**rmlv**
Note: If the LV is configured for shadow replication, break the shadow connection to remove the last common snapshot in the series (see unshadow).	
• Remove LVs	**rmlv**

Usage:

```
VSX shelf> rmpv -?
usage: rmpv PV [...]
VSX shelf>
```

Command argument	Description
`[...]`	Enter a series of sequentially numbered PVs as a range indicated by a dash (-). This allows you to remove more than one PV at a time.

Example:

```
VSX shelf> pvs
PV           TOTAL(GB)     FREE(GB) MIRROR     STATE       POOL
7.5          1000.205      900.165             single      sales
7.6          1000.205      900.165             single       mktg
7.7          1000.205      900.165             single       mktg
7.8          1000.205      900.165             single       mktg
7.9          1000.205      900.165             single       mktg
VSX shelf> rmpv 7.9
VSX shelf> pvs
PV           TOTAL(GB)     FREE(GB) MIRROR     STATE       POOL
7.5          1000.205      900.165             single      sales
7.6          1000.205      900.165             single       mktg
7.7          1000.205      900.165             single       mktg
7.8          1000.205      900.165             single       mktg
VSX shelf>
```

■ **rollback**

The `rollback` command is used to set an LV back to a known "good state" using a specified snapshot. Specifically, the `rollback` command:

• sets the LV to match a specified snapshot

• removes any snapshots created after the specified snapshot

Note: Place the VSX LUN associated with the LV offline prior to using the `rollback` command.

Usage:

```
VSX shelf > rollback -?
usage: rollback LV [LV.snap]
VSX shelf >
```

Command argument	Description
LV	Enter the name of the LV that you want to roll back.
[LV.snap]	Specify the name and number of the snapshot you want to use to roll back the associated LV. If the argument LV.snap (i.e., snapshot) is not specified, the LV is rolled back to the most recent snapshot in the list.

■ **sanaddr**

The `sanaddr` command displays the SAN address for that VSX shelf. This is the SAN address used to identify the VSX appliance when setting up high availability configurations. For more information, see harole.

Usage:

```
VSX shelf > sanaddr -?
usage: sanaddr
VSX shelf >
```

■ **scpwipe**

Deletes all files in the scp/ftp holding area in VSX memory. Use this command when you need to create more space to download CorOS update files.

Usage:

```
VSX shelf> scpwipe -?
usage: scpwipe
VSX shelf>
```

■ **security**

The `security` command lists the IP address and hash value for all remote VSX appliances. Security parameters are configured using the setsecurity command which is required in order to make a shadow connection between a source VSX and a target VSX. Without an argument, the `security` command lists all security parameters in IP address lexical order.

Usage:

```
VSX shelf> security -?
usage: security [ address ] [ ... ]
VSX shelf>
```

Command argument	Description
`[ address ] [ ... ]`	Enter one or more VSX IP addresses to get a list of the security parameters for the specified IP address(es).

■ **serial**

Displays the manufacturing-assigned serial number of the VSX.

Usage:

```
VSX shelf> serial -?
usage: serial
VSX shelf>
```

■ **series**

The `series` command permits you to test series expansion rules used for specifying pool, PV, LV, and LUN ranges prior to entering values in a command that supports ranges `[...]`. The `series` command displays the system's interpretation of any range you specify without actually executing a command.

Any two sets of numbers separated by a dash are expanded, and characters adjacent to the numbers are retained.

Usage:

```
VSX shelf> series -?
usage: series lv-range | target-range
VSX shelf>
```

`range` can be a combination of numbers and characters. Multiple and nested ranges may be expanded with a single command. A few examples illustrate ranges:

```
VSX shelf> series Athens0-10
Athens0 Athens1 Athens2 Athens3 Athens4 Athens5 Athens6 Athens7
Athens8 Athens9 Athens10
```

-or-

```
VSX shelf> series 7.6-9
7.6 7.7 7.8 7.9
```

-or-

```
VSX shelf> series LV000-5
LV000 LV001 LV002 LV003 LV004 LV005
```

For longer series, the first number in the range may be filled with zeros to indicate padding for the entire range. This is recommended to ensure proper lexical sorting of large numbers of objects. For example:

```
VSX shelf> series POOL00-10
POOL00 POOL01 POOL02 POOL03 POOL04 POOL05 POOL06 POOL07 POOL08
POOL09 POOL10
```

Compare an unpadded range:

```
VSX shelf> series 100.0-10
100.0 100.1 100.2 100.3 100.4 100.5 100.6 100.7 100.8 100.9
100.10
```

A single range expression can be expanded into multiple ranges:

```
VSX shelf> series acct0-2pool1-3
acct0pool1 acct0pool2 acct0pool3 acct1pool1 acct1pool2
acct1pool3 acct2pool1 acct2pool2 acct2pool3
```

-or-

```
VSX shelf> series 0-2.1-3
0.1 0.2 0.3 1.1 1.2 1.3 2.1 2.2 2.3
```

■ **service**

The service command configures available protocol services for the VSX (FTP, SSH and NTP). Without arguments, each service and its status is displayed. The service configuration persists across reboot. By factory default, FTP and NTP are disabled and SSH is enabled.

Usage:

```
VSX shelf> service -?
usage: service [ protocol  { enable | disable } ]
VSX shelf>
```

Command argument	Description
`[protocol { enable	disable }]`	Enter the protocol name (`ftp`, `ssh`, or `ntp`) and `enable` to allow protocol services or `disable` to restrict protocol services.

For example:

```
VSX shelf> service
SERVICE       STATUS
ftp           disabled
ntp           disabled
ssh           enabled

VSX shelf> service ntp enable

VSX shelf> service
SERVICE       STATUS
ftp           disabled
ntp           enabled
ssh           enabled
```

■ **sethold**

The `sethold` command enables the hold setting on a snapshot. Snapshots with the hold setting enabled are never automatically deleted. Snapshots with the hold setting enabled can be manually deleted with the rmlv command.

The hold setting for a snapshot is displayed using the lvsnaps command (`HOLD` column).

Usage:

```
VSX shelf> sethold -?
usage: sethold LV.snap [...]
VSX shelf>
```

Command argument	Description
`LV.snap [...]`	Enter a specific snapshot or a series of sequentially numbered snapshots as a range indicated by a dash (-). This allows you to enable the hold setting on more than one snapshot at a time.

■ **setmotd**

The `setmotd` command configures a banner message on terminals connected to the VSX via SSH. Without the uploaded file argument, the `setmotd` command enters a message-of-the-day (MOTD) session where a message to all users can be created. To exit and save the configuration, select `Enter Ctrl-d`. The `setmotd` command can optionally take a single argument, an uploaded filename (text file), which can be used as the message-of- the-day banner.

To remove the message, press Enter while in editing mode.

Usage:

```
VSX shelf> setmotd -?
usage: setmotd [ uploaded file ]
VSX shelf>
```

To view the MOTD banner, see motd.

■ **setpoolmode**

The setpoolmode command allows you to configure how extents are allocated from the PVs in the pool. Changing the setting does not affect extents that have already been allocated to the LV; only future allocations are affected. Settings include:

- concat— allocates LV data extents from the first PV in the pool that has the most free extents. In other words, if the pool is set to concat, any LVs created from the pool are created from the *next* PV that has free extents. Modifying the mode frees and reallocates space in the PV. This is the default setting when a pool is created using the mkpool command.

- striped— allocates LV data extents using a round-robin method from all PVs in the pool. In other words, if the pool is set to striped, any LVs created from the pool are created across multiple PVs so that I/O to a VSX LUN in the pool is done in parallel. Modifying the mode frees and reallocates space in the PV.

Use the setpoolmode command to change the LV data extent allocation mode for one or more specified pools.

Usage:

```
VSX shelf> setpoolmode -?
usage: setpoolmode [striped | concat] pool [...]
VSX shelf>
```

Command argument	Description
[striped | concat]	Enter one of the following to change the LV data extent allocation mode for each pool created on the VSX: • striped • concat
pool [...]	Enter the name of the pool or a series of pools to change the LV data extent allocation mode setting for one or more specified pools.

Use the pools command to verify that extents are either:

- striped—distributed evenly across all PVs in the pool

- concat—distributed on one of the PVs in the pool

■ **setremote**

The setremote command is used to link a single VSX or a VSX HA pair (primary and secondary IP address) to one remote name (RNAME). RNAME is a local abstract name used to identify the remote VSX/VSX HA pair. The RNAME is then used in the shadowrecv and shadowsend commands to configure LV shadow replication. If the VSX is not part of an HA pair, specify an RNAME and a single IP address for the remote VSX. Also note the following:

• The RNAME must not exceed 20 characters.

• The setsecurity command must be issued prior to issuing the setremote command (IP addresses must have already been authenticated).

• The IP address specified must not be assigned by a previous use of the setremote command

• Do not enter the same IP address twice (primary and secondary IP addresses must be different)

Usage:

```
VSX shelf>  setremote -?
usage:  setremote RNAME [ address ] [ address ]
VSX shelf>
```

Command argument	Description
RNAME	Enter a name for the remote VSX/VSX HA pair. Make sure the name does not exceed 20 characters.
[address] [address]	Enter the IP address(es) for the primary and secondary remote VSX. If there is only one remote VSX, enter a single IP address.

To remove the remote name:

To remove an already assigned RNAME, issue the setremote command and the RNAME. For example:

```
VSX shelf> setremote VSXtarget
```

Remote names that are currently in use (specified by the shadowrecv or shadowsend commands) cannot be removed.

■ **setsecurity**

The setsecurity command secures the connection between two VSX appliances used for shadow replication (source and target VSX appliances). In order to establish a shadow connection between two VSX appliances, the local VSX must accept the hash value of the certificate presented by the remote VSX. The setsecurity command must be issued before you can issue the setremote command.

Note: 1024-bit RSA is used for cryptography. SHA-1 is used for data integrity.

Usage:

```
VSX shelf>  setsecurity -?
usage:  setsecurity address [ { encrypt | null } certhash ]]
VSX shelf>
```

Command argument	Description
address	Enter the an IP address for remote VSX (can be the primary VSX or the secondary VSX.
{ encrypt | null }	Enter encrypt to encrypt the connection to the remote VSX using 128-bit AES. Enter null so that the connection to the remote VSX is not encrypted. **Note:** This setting must be the same on the source and target VSX appliances otherwise the shadow connection between the appliances will not be established.
certhash	Enter the hash value of the certificate presented by the remote VSX. See the certhash command to get the hash value of the remote VSX appliance.

To remove security parameters

To remove already assigned security parameters, issue the setsecurity command with the primary IP address of the remote VSX. For example:

```
VSX shelf 320> setsecurity 20.20.20.36
```

You cannot remove the security parameters if the setremote command has already been configured to use the specified IP address.

■ **setsnaplimit**

The setsnaplimit command sets the potential snapshot storage limit for an LV. The snapshot limit size is *not* immediately allocated. The size represents the maximum amount of storage that can be taken from the pool for snapshots of a specified LV. When the space limit is reached, old snapshots with a disabled hold setting are removed to free up space. When a snapshot is taken, the number of used extents in the LV is added to the number of snapshot extents in LV snapshots. If the total space is greater than the LV snapshot limit the snapshot request is denied. This is to prevent the snapshot from becoming invalid if all LV extents are changed in the LV and need to be attributed to the snapshot. The snapshot limit default setting for a new LV is ignore.

Confirmation is required.

```
VSX shelf>   setsnaplimit -?
usage: setsnaplimit [ size[T,G,M,K] | ignore ] LV [ LV ... ]
VSX shelf>
```

Command argument	Description
size[T,G,M,K]	Enter the maximum amount of space from the pool to be used for snapshots of a specified LV.
	The size must be entered in decimal form followed by T, G, M or K to indicate the size in Terabytes, Gigabytes, Megabytes, or Kilobytes respectively. If no letter is specified, the number is interpreted as a byte count.
ignore	Enter ignore to bypass setting a snapshot limit. In this case, older (hold setting disabled) snapshots are *not* removed automatically to free up space. However, scheduled snapshots may still be removed based on the retain count set using the setsnapsched command. A setting of ignore means that you may need to manage the number of saved snapshot manually to avoid using up the free space in the pool.
[LV ...]	Enter a specific LV or a series of sequentially numbered LVs as a range indicated by a dash (-). This allows you to set the same snapshot limit on more than one LV. `VSX shelf> setsnaplimit 10G Athens1-3.`

■ **setsnapsched**

The setsnapsched command sets the schedule for automated snapshots of one or more LVs. Each snapshot schedule is configured so that snapshots of an LV are taken according to a specified class. The class parameter can be hourly, daily, weekly, monthly, or yearly. Each LV can have up to 32 snapshot schedule instances in any combination of classes. If shadow replication is also configured snapshots are replicated to a target LV (see Shadow). Additional parameters are described in the table.

Usage:

```
VSX shelf>   setsnapsched -?
usage: setsnapsched class time retain LV [...]
VSX shelf>
```

setsnapsched command and shadow replication

On the target VSX LV, the setsnapsched command is *only* used to set the retain limit of the shadowed snapshots. The class and time parameters (e.g., daily @17:15) are set at the source VSX and must also be entered on the target VSX when setting the retain limit. When the source and target VSX appliances are in different time zones, the snapshot time stamps displayed in the output of the lvsnaps command on the target VSX will not match those on the source VSX since each is displayed according to the local time zone. To identify corresponding snapshots on the source and target VSX, use the snapshot numbers (e.g., Athens.1 and Athenstarget.1). See the example below.

In the following example, VSX 320 is the source VSX and the time zone is set to US_Pacific and VSX 512 is the target VSX and the time zone is set to US_Eastern. The source LV, Athens, is copied to the target LV, Athenstarget. When the lvsnaps command is issued the snapshot DATE for Athens.1, 171500, matches the schedule, @17:15:

```
VSX shelf 320> lvsnaps
SNAPSHOT              DATE    SIZE(GB)   CLASS     SCHEDULE    HOLD
Athens.1 20120216.171500   100.000    daily      @17:15   disabled
```

On the target VSX, the schedule description is identical (i.e., @17:15), but the DATE is displayed using the local time zone which is three hours ahead.

```
VSX shelf 512> lvsnaps
SNAPSHOT                 DATE    SIZE(GB) CLASS  SCHEDULE      HOLD
Athenstarget.1 20120216.201500   100.000   daily    @17:15   disabled
```

Command argument	Description
`class`	Enter one of the following parameters to identify how often you want to take a snapshot of the LV: • hourly • daily • weekly • monthly • yearly
`time`	Enter one of the following `time` parameters as it relates to the class parameter. For the following class types: • hourly (@mm)—enter the @ symbol and then a number between 0 to 59. For example: `@17`. • daily (@hh:mm)—enter the @ symbol and then a number based on a 24-hour clock (0-23). For example: `@22:17` • weekly (week@hh:mm)—enter the day of the week (`Sun`, `Mon`, `Tue`, `Wed`, `Thu`, `Fri`, `Sat`), an @ symbol and then a number based on a 24-hour clock (0-23). For example: `Tues@22:17` • monthly (day@hh:mm)—enter the day of the month (1-28), an @ symbol, and then a number based on a 24-hour clock (0-23). For example: `15@22:17` • yearly (mm.dd@hh:mm)—enter the month.day, an @ symbol, and then a number based on a 24-hour clock (0-23). For month enter one of the following: `Jan`, `Feb`, `Mar`, `Apr`, `May`, `Jun`, `Jul`, `Aug`, `Sep`, `Oct`, `Nov`, `Dec`. For example: `Jun.3@22:17`
`retain`	Enter a number between `1-256` to indicate the number of snapshots to retain for a particular schedule before deleting the oldest snapshot in the group (the hold setting is displayed as `disabled`; see lvsnaps). Enter `hold` to retain all snapshots (the hold setting is displayed as `enabled`; see lvsnaps).
`LV [LV ...]`	Enter a specific VSX LV name or a series of sequentially numbered VSX LV names as a range indicated by a dash (-). This allows you to create the same schedule on one or more LVs.

■ **shadowrecv**

The shadowrecv command is issued from the target VSX to establish a shadow connection between the source LV and the target LV. The target LV receives snapshots from an LV on the source VSX. To make the connection, the target VSX uses the RNAME of the source VSX (see setremote).

If you are using a firewall between source and target VSX appliances, make sure that communication on TCP port 17760 is allowed for the configured IP addresses. TCP port 17760 is used to listen for connections from the shadowsend command.

The shadowrecv command fails in the following instances:

• The RNAME is not defined by setremote

• The LV has a LUN assigned to it

• The LV on the target VSX is already being used for shadowrecv or shadowsend

• The LV is a snapshot LV

• The LV has data that is not in the most recent associated snapshot

Usage:

```
VSX shelf>   shadowrecv -?
usage:  shadowrecv RNAME source_LV [...] to LV [...]
VSX shelf>
```

Command argument	Description
RNAME	Enter the remote name (RNAME) of the source VSX. Issue the remote command to get a list of RNAMEs assigned by the target VSX.
source_LV [...]	Enter the name of the LV on the source VSX that has snapshots you want to shadow to the target VSX.
to LV [...]	Enter to and then the name of the target LV. The target LV receives a copy of the snapshot from the source VSX.

■ shadowsend

The shadowsend command is issued from the source VSX to establish a shadow connection between the source LV and the target LV. The source LV sends snapshots to a designated LV on the target VSX. To make the connection, the source VSX uses the RNAME of the target VSX (see setremote).

The shadowsend command fails in the following instances:

- The primary and secondary VSX are unreachable

- The target VSX does not have a target LV configured (see shadowrecv)

- The shadow target LV has a smaller capacity than the source LV

- A snapshot with the same number does not have the same class and time stamp on both the source and target VSX

- A snapshot with the same time stamp does not have the same snapshot number on both the source and target VSX

- The most recent snapshot for the target LV does not exist on the source LV

Usage:

```
VSX shelf>   shadowsend -?
usage:  shadowsend RNAME source_LV [...] to LV [...]
VSX shelf>
```

Command argument	Description
RNAME	Enter the remote name (RNAME) of the target VSX. Issue the remote command to get a list of RNAMEs assigned by the source VSX.
source_LV [...]	Enter the name of the LV on the source VSX that has snapshots you want to shadow to the target VSX.
to LV [...]	Enter to and then the name of the target LV. The target LV receives a copy of the snapshot from the source VSX.

■ **shelf**

The `shelf` command configures the VSX base shelf address to a number between 0 and 65504. Before you set the VSX base shelf address, *unset* appears in the VSX prompt. After you set the shelf address, *unset* is replaced by the shelf base address.

The number selected plus the next 15 numbers in the sequence are reserved for that VSX and can be used to assign to VSX LUNs. The VSX base shelf address and its range must not conflict with other shelf addresses on the SAN.

Usage:

```
VSX shelf unset> shelf -?
usage: shelf [ 0 - 65504 ]
VSX shelf unset> shelf 320
VSX shelf 320>
```

Command argument	Description
`[ 0 - 65504 ]`	Enter `shelf` and a number between 0 and 65504 to identify the VSX. The number selected plus the next 15 numbers in the sequence are reserved for that VSX and can be used to assign to VSX LUNs.

Note: If you attempt to change the VSX base shelf address after you have assigned VSX LUNs that use that base shelf range (base shelf plus the next 15 numbers), you are prompted to change the shelf portion (`shelf.lun`) of all VSX LUN assignments. You need to offline all VSX LUNs prior to changing the base shelf address. For example:

```
VSX shelf 320> offline 330.1
VSX shelf 320> shelf 64
Request to change base shelf from 320 to 64. Affecting 1 lun
LV            OLD LUN      NEW LUN
Athens        330.1        74.1

'n' to cancel, or 'y' to change all [n]: y
VSX shelf 64> luns
LUN    STATUS      LV            SIZE(GB)    MODE        MASKS
74.1   offline     Athens        100.000     r/w         0
```

A message regarding the shelf address change is also sent to the syslog server.

▪ snap

The snap command creates manual snapshots for one or more LVs. The default hold setting is enabled for manual snapshots. LV snapshot names are automatically generated and are numbered sequentially starting from 1, using the source LV name as a prefix (LVname.1, LVname.2, etc.). Once a snapshot has been taken, the snapshot shares data extents with the source LV. Other LV characteristics (MAC mask, configuration string, VSX LUN) are not shared. When the source LV is written, extents are remapped to create LV private copies, leaving snapshot extents read-only.

Usage:

```
VSX shelf> snap -?
usage: snap LV [...]
VSX shelf>
```

Command argument	Description
LV [...]	Enter a specific LV or a series of sequentially numbered LVs as a range indicated by a dash (-). This allows you to create snapshots for more than one LV at a time.

See Snapshots of logical volumes for more information on snapshots.

▪ snaplimit

The snaplimit command displays the snapshot limit set for LVs (see setsnaplimit).

Column	Description
LV	Indicates the LV name.
LIMIT (GB)	Indicates the snapshot limit configured using the setsnaplimit command. ignore is displayed if the snapshot limit is not set or set to ignore.
USED (GB)	Indicates the amount of space already used by snapshots for the specified LV.

Usage:

```
VSX shelf> snaplimit -?
usage: snaplimit  [ LV ... ]
VSX shelf>
```

Command argument	Description
LV [...]	Enter a specific LV or a series of sequentially numbered LVs as a range indicated by a dash (-). This allows you to get snapshot limit settings for snapshots for more than one LV at a time. If you don't enter an LV, all snapshot limits are displayed.

■ **snapsched**

The snapsched command displays the schedule characteristics of scheduled snapshots (LV, CLASS, TIME, RETAIN). The snapshot schedule is created using the setsnapsched command.

Column	Description
LV	Indicates the LV name.
CLASS	Indicates the type of schedule configured (hourly, daily, weekly, monthly, or yearly).
TIME	Indicates the time when a snapshot should be taken (see setsnapsched for more information).
RETAIN	Indicates the retain limit for snapshots taken of an LV for a particular schedule instance. The retain limit can be a number between 1-256. If a retain limit is set, all snapshots taken within that schedule instance have the hold setting disabled. Hold is indicated if retain is set to hold (indicates that all snapshots within that schedule instance have the hold setting enabled).

Usage:

```
VSX shelf> snapsched -?
usage: snapsched LV [...]
VSX shelf>
```

Command argument	Description
LV [...]	Enter a specific LV or a series of sequentially numbered LVs as a range indicated by a dash (-). This allows you to get snapshot schedule instances for one or more LVs. If you don't enter an LV, all LVs that have a snapshot schedule are displayed.

■ **sos**

The `sos` command captures output status and configuration information and stores it in the local file holding area for download by scp or ftp. In situations where the file cannot be retrieved, `sos` may be displayed on-screen using the `-t` flag.

The `sos` command only reports information regarding configuration and status of the VSX appliance. It does *not* include any information about the data stored through the VSX.

In a stand-alone VSX architecture it is very important to keep a back-up of the VSX configuration file. The VSX configuration is contained in the output of the `sos` diagnostic. To create a back-up of the VSX configuration, run the `sos` command in the VSX CLI and then download the file to save it. The VSX configuration at the time the `sos` command was run can be recreated on a new or replacement VSX appliance.

Note: A new `sos` file must be saved each time any of the commands listed below are run. The `sos` file captured prior to running any of the commands listed below will not contain the most recent mapping of the physical storage and cannot be used to recover the most recent VSX configuration.

- `shelf`
- `mkpool`
- `rmpool`
- `mkpv`

- `rmpv`
- `mirror`
- `unmirror`
- `promote`
- `brkmirror`

Contact Coraid Technical Assistance Center for more information.

Usage:

```
VSX shelf> sos -?
usage: sos [ -t ]
VSX shelf>
```

Command argument	Description
[-t]	This flag also displays the `sos` file to the screen if you are unable to use scp or ftp.

■ **syslog**

The `syslog` command configures the destination server IP for syslog UDP messages.

Without arguments, `syslog` displays the destination server address and the source address. All syslog messages generated by the VSX are sent to the configured IP address at UDP port 514.

Syslog test messages may be generated using the `syslogtest` command.

Usage:

```
VSX shelf> syslog -?
usage: syslog [ Dest IP address ]
VSX shelf>
```

Command argument	Description
[Dest IP address]	Enter the IP address of the server to which you want to send the syslog.

Also see the logwatch command.

■ **syslogtest**

The `syslogtest` command allows you to send a test message to the IP address of the syslog server you configured using the `syslog` command.

Usage:

```
VSX shelf> syslogtest -?
usage: syslogtest msg
VSX shelf>
```

The message is comprised of all arguments concatenated into a single string.

■ **temp**

The `temp` command displays the temperature of the system power supply and the CPU.

Usage:

```
VSX shelf> temp -?
usage: temp
VSX shelf>
```

Example:

```
VSX shelf> temp
LOCATION    TEMP
cpu          43C
sys          64C
VSX shelf>
```

■ **timesource**

The `timesource` command controls whether the VSX system time is maintained by a Network Time Protocol (NTP) server or a VSX local clock. Without an argument, `timesource` displays the selected time source.

Usage:

```
VSX shelf> timesource -?
usage: timesource [ ntp IPaddress | local yyyymmdd.hhmmss ]
VSX shelf>
```

Command argument	Description

`[ ntp IPaddress |`
 	
-or-
 	
`local yyyymmdd.hhmmss ]`
	Enter `ntp` and then the IP address of the NTP server that will be used to keep time on the VSX.

	Enter `local` and then the following information in the form `yyyymmdd.hhmmss`: • yyyy—year (must be greater than 1970) • mm—month (01-12) • dd—day (00-31) • hh—hour (00-23) • mm—minute (00-59) • ss—second (00-59)

Note: Successful communication with NTP servers outside the IP broadcast domain of the VSX IP address(es) (see ipaddress) requires a properly configured IP gateway (see ipgateway).

If no NTP server or local time is configured, the VSX maintains system time according to the hardware clock set in the BIOS.

■ **timezone**

Sets the local time zone. See To set time zone and time source for more information.

Usage:

```
VSX shelf> timezone -?
usage: timezone [ -l ] [ timezone ]
```

Command argument	Description
[-l]	Enter timezone -l for a list of available time zones.
[timezone]	Enter timezone and then the name of the time zone to set the local time zone for the VSX.

■ **unmirror**

The unmirror command removes the SRX LUN (mirrored target) from the specified PV, breaking the mirror connection. Once released, the SRX LUN is free for reuse.

To remove a primary PV from the configuration, promote the mirror target using the promote command, then remove the PV mirror.

A range can be used to specify PVs.

Usage:

```
VSX shelf> unmirror -?
usage: unmirror PV [...]
VSX shelf>
```

Command argument	Description
PV [...]	Enter the PV (primary) or series of primary PVs (e.g., 7.6-9) to remove corresponding mirror target(s).

unshadow

The unshadow command removes the shadow attribute (shadowrecv or shadowsend) from one or more LVs. It removes one side of the connection depending on where the command is issued (VSX source or VSX target). If the LV is a shadowrecv LV, snapshot schedules are also removed. Any snapshots that are in the process of a shadow copy are stopped. Any incomplete snapshot data on the target LV can be deleted using the rollback command.

Usage:

```
VSX shelf> unshadow -?
usage: unshadow LV [...]
VSX shelf>
```

Command argument	Description
LV [...]	Enter the LV or the series of LVs whose shadow connection you want to remove. For an LV series, indicate the LV range by using a dash (-).

update

The update command is used to update the   OS on the VSX (see Updating the CorOS for summary information). Specific instructions for updating the CorOS are provided in the *CorOS Update Addendum*.

Without arguments update displays all .pkg files in the local file holding area that have been uploaded by scp or ftp. Specifying a package argument (update name.pkg) updates the VSX CorOS release with name.pkg. Reboot is enforced upon update completion. Confirmation is required.

Usage:

```
VSX shelf> update -?
usage: update [ name.pkg ]
VSX shelf> update
There are no update files.
To upload a file:
scp name.pkg admin@10.10.10.145:
ftp name.pkg to 10.10.10.145
```

uptime

Displays how long the VSX has been running since the last reboot.

Usage:

```
VSX shelf> uptime -?
usage: uptime
VSX shelf>
```

■ **wstat**

The wstat command displays the status of all mirror and shadow processes. The displayed status includes:

Column	Description
ACTION	Displays mirror and the PV and SRX LUN being mirrored.
	-or-
	Displays shadow, the snapshot name and the destination VSX LUN for the snapshot.
DONE (%)	Displays the percentage of the process that is complete.
RATE (MB/s)	Displays the transfer rate of the data in megabytes per second.
TTC	Displays the estimated time to completion (TTC) in the format dd:hh:mm:ss (days, hours, minutes, seconds).

Usage:

```
VSX shelf> wstat -?
usage: wstat
VSX shelf>
```

Workflow examples

The following examples depict typical workflows for basic VSX functions. The VSX shelf, pools, LVs, and LUN conventions used in these examples are defined in Terminology and Conventions.

Example: creating a VSX LUN

```
VSX shelf 320> aoestat
TARGET      SIZE(GB) PORT(S)
7.5         1000.205 ether2
7.6         1000.205 ether2
7.7         1000.205 ether2
7.8         1000.205 ether2
7.9         1000.205 ether2
20.5        1000.205 ether2
20.6        1000.205 ether2
20.7        1000.205 ether2
20.8        1000.205 ether2
20.9        1000.205 ether2
VSX shelf 320> mkpool -?
usage: mkpool name [...]
VSX shelf 320> mkpool sales
VSX shelf 320> mkpool mktg
VSX shelf 320> pools
POOL   #PVs   TOTAL(GB)    FREE(GB) USED(%)     MODE
sales    0     0.000        0.000        0 concat
mktg     0     0.000        0.000        0 concat
VSX shelf 320> mkpv -?
usage: mkpv pool target [...]
VSX shelf 320> mkpv sales 7.5
VSX shelf 320> mkpv mktg 7.6-9
VSX shelf 320> pvs
PV     TOTAL(GB)    FREE(GB) MIRROR    STATE            POOL
7.5    1000.205     900.165            single           sales
7.6    1000.205     900.165            single           mktg
7.7    1000.205     900.165            single           mktg
7.8    1000.205     900.165            single           mktg
7.9    1000.205     900.165            single           mktg
```

Creating a VSX LUN (con't)

```
VSX shelf 320> mklv -?
usage: mklv [-t] pool size[T,G,M,K] name [...]
VSX shelf 320> mklv sales 100G Athens
VSX shelf320> lvs
LV          SIZE(GB) MODE       LUN POOL  PROV SHADOW     STATE
Athens      100.000  r/w            sales thick          healthy
VSX shelf 320> mklun -?
usage: mklun LV [... to] LUN [...]
VSX shelf 320> mklun Athens 330.1
VSX shelf 320> luns
LUN         STATUS       LV      SIZE(GB)  MODE     MASKS
330.1       offline    Athens    100.000   r/w        0
VSX shelf 320> online 330.1
VSX shelf 320> luns
LUN         STATUS       LV      SIZE(GB)  MODE     MASKS
330.1       online     Athens    100.000   r/w        0
```

Example: creating a PV mirror

```
VSX shelf 320> pvs
PV          TOTAL(GB)    FREE(GB) MIRROR    STATE       POOL
7.5         1000.205     900.165            single      sales
7.6         1000.205     900.165            single      mktg
7.7         1000.205     900.165            single      mktg
7.8         1000.205     900.165            single      mktg
7.9         1000.205     900.165            single      mktg
VSX shelf 320> aoestat
TARGET      SIZE(GB) PORT(S)
7.5         1000.000 ether2
7.6         1000.000 ether2
7.7         1000.000 ether2
7.8         1000.000 ether2
7.9         1000.000 ether2
20.5        1000.000 ether2
20.6        1000.000 ether2
20.7        1000.000 ether2
20.8        1000.000 ether2
20.9        1000.000 ether2
VSX shelf 320> mirror 7.6-9 to 20.6-9
VSX shelf 320> pvs
PV     TOTAL(GB)    FREE(GB)    MIRROR     STATE       POOL
7.5    1000.205     900.165                single      sales
7.6    1000.205     900.165      20.6      mirrored    mktg
7.7    1000.205     900.165      20.7      mirrored    mktg
7.8    1000.205     900.165      20.8      mirrored    mktg
7.9    1000.205     900.165      20.9      mirrored    mktg
```

Example: creating a manual snapshot

```
VSX shelf 320> lvs
LV            SIZE(GB) MODE      LUN POOL   PROV SHADOW    STATE
Athens        100.000  r/w           sales  thick         healthy

VSX shelf 320> setsnaplimit -?
usage: setsnaplimit [ size[T,G,M,K] | ignore ] LV [ LV ... ]

VSX shelf 320> setsnaplimit 10G Athens
Request to setsnaplimit 1 snapshot limit: Athens
'n' to cancel, 'a' for all, or 'y' to setsnaplimit to 10G on

Athens [n]: y

VSX shelf 320> snaplimit
LV                LIMIT(GB)     USED(GB)
Athens               10.000       0.000

VSX shelf 320> snap -?
usage: snap LV [...]
VSX shelf 320> snap Athens
VSX shelf> lvsnaps
SNAPSHOT           DATE    SIZE(GB)   CLASS     SCHEDULE    HOLD
Athens.1 20120216.145747   100.000   manual                enabled
```

Example: creating a snapshot schedule

```
VSX shelf 320> lvs
LV            SIZE(GB) MODE      LUN POOL   PROV SHADOW    STATE
Athens        100.000  r/w           sales  thick         healthy
VSX shelf 320> setsnaplimit -?
usage: setsnaplimit [ size[T,G,M,K] | ignore ] LV [ LV ... ]
VSX shelf 320> setsnaplimit 10G Athens
Request to setsnaplimit 1 snapshot limit: Athens
'n' to cancel, 'a' for all, or 'y' to setsnaplimit to 10G on
Athens [n]: y

VSX shelf 320> snaplimit
LV                LIMIT(GB)     USED(GB)
Athens               10.000       0.000

VSX shelf 320> setsnapsched -?
usage: setsnapsched class time retain LV [...]
VSX shelf 320> setsnapsched daily @17:15 hold Athens
VSX shelf 320> setsnapsched daily @18:15 5 Athens
VSX shelf 320> snapsched
LV                CLASS        TIME      RETAIN
Athens            daily        @17:15      hold
Athens            daily        @18:15         5
```

Example: enabling shadow replication

Hash information for primary VSX shelf 320 (source) →

Hash information for secondary VSX shelf 320 (source) →

Hash information for VSX shelf 512 (target) →

Set up security from VSX shelf 320 (source) →

Set up security from VSX shelf 512 (target) →

Includes both the primary and secondary VSX (source)

Set remote name from VSX shelf 320 (source) →

Set remote name from VSX shelf 512 (target) →

Includes the IP address of the primary and secondary VSX (source)

```
VSX shelf 320> certhash -?
usage: certhash
VSX shelf 320> certhash
c737c733d7cd7d3d33c3773c3333d7373d77c
VSX shelf 320>

VSX shelf inactive> certhash
m737k733k7m7k3k33m3773m3333k7373m77m
VSX shelf inactive>


VSX shelf 512> certhash
5f454a5f45455afa4554f4faf4555f4454554f4f5
VSX shelf 512>

VSX shelf 320> setsecurity -?
usage: setsecurity address [ { encrypt | null } certhash ]

VSX shelf 320> setsecurity 20.20.20.36 encrypt
5f454a5f45455afa4554f4faf4555f4454554f4f5
VSX shelf 320> security
 IP ADDRESS ENCRYPT HASH
20.20.20.36     yes 5f454a5f45455afa4554f4faf4555f4454554f4f5


VSX shelf 512> setsecurity 10.10.10.145 encrypt
c737c733d7cd7d3d33c3773c3333d7373d77c
VSX shelf 512> setsecurity 10.10.10.156 encrypt
m737k733k7m7k3k33m3773m3333k7373m77m
VSX shelf 512> security
  IP ADDRESS ENCRYPT HASH
10.10.10.145     yes c737c733d7cd7d3d33c3773c3333d7373d77c
10.10.10.156     yes m737k733k7m7k3k33m3773m3333k7373m77m


VSX shelf 320>  setremote -?
usage: setremote RNAME [ address ] [ address ]
VSX shelf 320> setremote VSXtarget 20.20.20.36
VSX shelf 320> remote
               NAME      IP ADDRESS      IP ADDRESS
            VSXtarget    20.20.20.36


VSX shelf 512>  setremote VSXsource 10.10.10.145 10.10.10.156
VSX shelf 512> remote
               NAME      IP ADDRESS      IP ADDRESS
            VSXsource   10.10.10.145    10.10.10.156
```

```
VSX shelf 512> lvs
LV              SIZE(GB) MODE   LUN  POOL      PROV SHADOW    STATE
Athenstarget 100.000  r/w  salestarget   thick            healthy
```

Set snapshot limit for LV
on VSX shelf 512 (target)

```
VSX shelf 512> setsnaplimit -?
usage: setsnaplimit [ size[T,G,M,K] | ignore ] LV [ LV ... ]
VSX shelf 512> setsnaplimit 10G Athenstarget
Request to setsnaplimit 1 snapshot limit: Athenstarget
'n' to cancel, 'a' for all, or 'y' to setsnaplimit to 10G on
Athenstarget [n]: y

VSX shelf 512> snaplimit
LV               LIMIT(GB)    USED(GB)
Athenstarget        10.000       0.000
```

Configure the target LV
for shadow replication
VSX shelf 512 (target)

```
VSX shelf 512> shadowrecv -?
usage: shadowrecv RNAME source_LV [...] to LV [...]
VSX shelf 512> shadowrecv VSXsource Athens to Athenstarget
VSX shelf 512> lvs
LV              SIZE(GB) MODE   LUN  POOL      PROV SHADOW    STATE
Athenstarget 100.000  r/w  salestarget   thick  recv   healthy
```

Configure a retain count
for target LV
VSX shelf 512 (target)

```
VSX shelf 512> setsnapsched -?
usage: setsnapsched class time retain LV [...]
VSX shelf 512> setsnapsched daily @18:15 7 Athenstarget


VSX shelf 320> lvs
LV              SIZE(GB) MODE   LUN  POOL      PROV SHADOW    STATE
Athens      100.000  r/w       sales thick            healthy
```

Configure source LV for
shadow replication
VSX shelf 320 (source)

```
VSX shelf 320> shadowsend -?
usage: shadowsend RNAME LV [...] to target_LV [...]
VSX shelf 320> shadowsend VSXtarget Athens to Athenstarget
VSX shelf 320> lvs
LV              SIZE(GB) MODE   LUN  POOL      PROV  SHADOW    STATE
Athens      100.000  r/w       sales thick    send   healthy
VSX shelf 320>
```

Example: creating a clone of a snapshot

```
VSX shelf 320> lvs
LV              SIZE(GB) MODE   LUN  POOL      PROV SHADOW    STATE
Athens      100.000  r/w       sales thick            healthy

VSX shelf 320> clone -?
usage: clone orig_LV new_LV [...]
VSX shelf 320> clone Athens.1 NYC
VSX shelf 320> lvs
LV              SIZE(GB) MODE    LUN POOL   PROV SHADOW    STATE
Athens      100.000  r/w       sales thick         healthy
NYC         100.000  r/w       sales thick         healthy
```

Installing VSX in an Equipment Rack

There are a variety of rack units on the market, so the rack assembly procedure that came with your unit may differ slightly from the instructions in this section. If necessary, refer to both instructions.

Note: The rails fit a rack between 26 inches and 33.5 inches deep.

Components of the rail assemblies

The shipping box includes left and right rail pairs. Each pair consists of an inner and an outer segment which you must separate prior to assembly.

- **Inner rails**—The inner rails attach to the left and right sides of the appliance and are secured on each side by a locking mechanism and a single screw. Left and right inner rails are identified by initials stamped into the metal (LH and RH, respectively).

- **Outer rails**—The tool-less outer rails attach to the equipment rack without screws.

Note: Use the inner and outer rail sections that shipped with the VSX. Mixing rail sections from different sets can cause the VSX to be unstable in the rack.
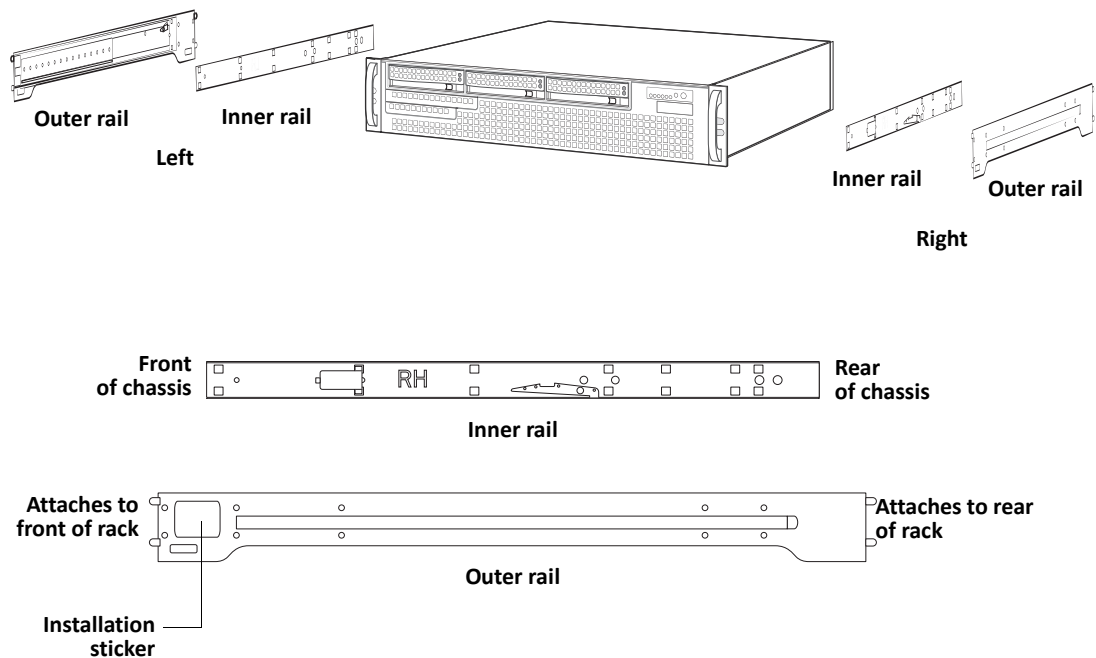

Figure 11: Rack rail components

Attaching the rails to the appliance and the rack

See the following procedures for detailed instructions.

To attach the inner rails to the appliance

1. **Separate the inner and outer rail segments.**

   Fully extend the rails, and then press down on the latch on the inner rail to separate the pair.
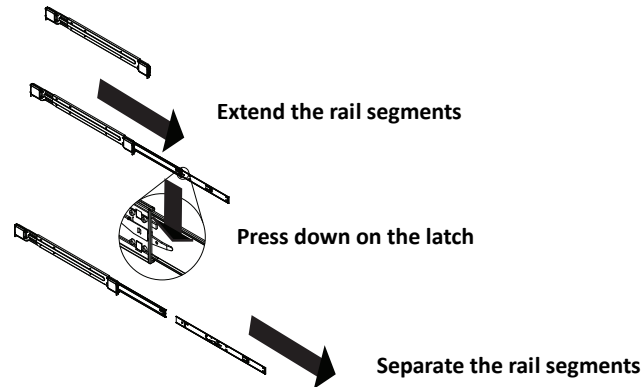

   Extend the rail segments

   Press down on the latch

   Separate the rail segments

   Figure 12: Separating the rail segments

2. **Identify the left and right inner rails by locating the LH and RH stamped into the metal.**

3. **Align the hooks on one side of the appliance with the corresponding holes in the appropriate inner rail, place the rail against the appliance and slide it toward the front of the appliance until it locks in place.**
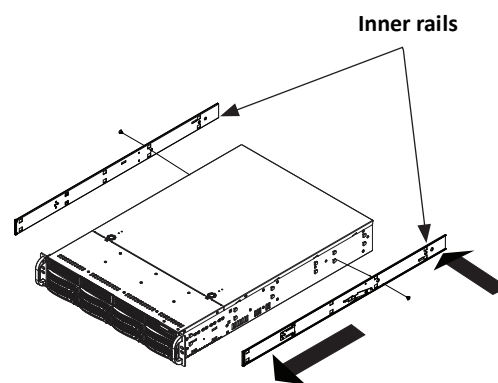
4. **Secure the rail with the screw.**

   Inner rails

   Figure 13: Attaching the inner rails

5. **Repeat the previous step to secure the second inner rail to the other side of the appliance.**

   Proceed to: .

To attach the outer rails to the rack

1. **Adjust the outer rail as necessary to fit the rack.**

   Press upward on the locking-tab to release the ball-bearing shuttle portion of the outer rail.

2. **For the ends of each outer rail determine the exact location in the rack for outer rail installation.**

   The rails attach to the rack via spring-loaded pegs and metal hooks at both ends of the rail. (See the installation label on each outer rail.)

3. **Insert the hooks and spring-loaded tabs on both ends of the outer rail into the target holes in the rack.**

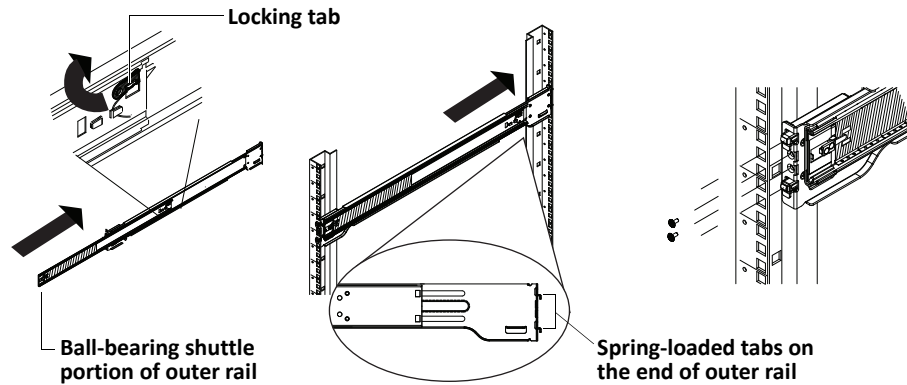4. **If necessary, secure the ends of the rails with screws.**

Figure 14: Attaching an outer rail to the rack

Installing the appliance in the rack

**Ball-bearing shuttle
portion of outer rail**
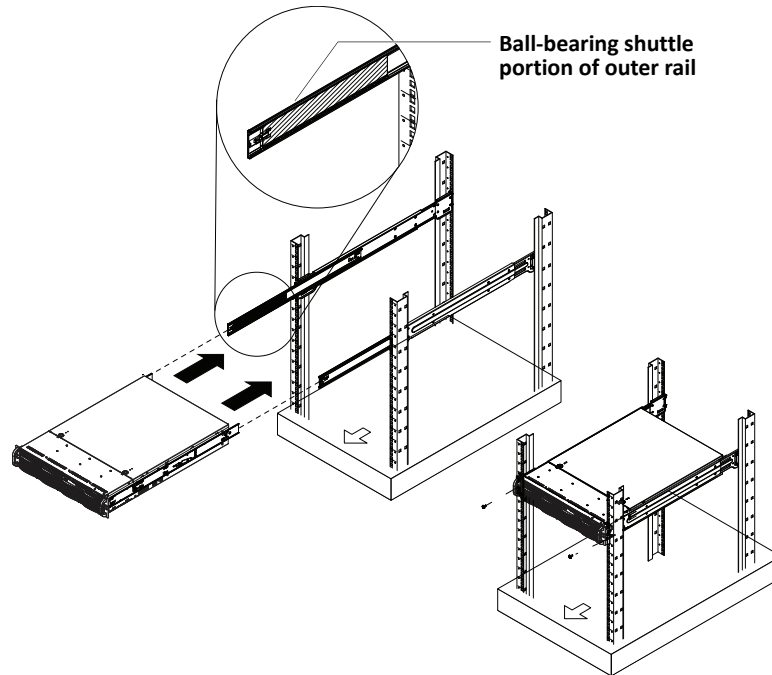
Figure 15: Sliding the chassis into the rack

To install the appliance into the rack

1. **Make sure that the inner rails are securely attached on the chassis and the outer rails are securely installed in the rack.**

2. **Extend the ball-bearing shuttle portions of both outer rails to their front locking positions.**

3. **Align the inner rails (on the appliance) with the outer rails (on the rack) and install the VSX.**

   • Slide the inner rails into the outer rails, keeping even pressure on both sides.

   • When it becomes necessary to do so, press to unlock the locking-tabs on the outer rails and fully install the appliance into the rack.

4. **(Optional) Insert and tighten the screws that hold the front of the appliance to the rack.**

Hardware Specifications and Precautions

Physical and environmental

Form Factor	2U chassis
Dimensions	3.5" high x 17.2" wide x 17.7" deep (89mm x 437mm x 450mm)
Weight	35 lbs (15.9 kg)
Operating Environment	Operating Temperature Range 10-35°C (50-95°F) Non-Operating Temperature Range -40 to +70°C (-40 to 158°F) Humidity Range 8-90% non-condensing Non-Operating Humidity Range 5-95% non-condensing
Fans	4x 4cm Counter-rotating fans
Power	700W (1+1) redundant AC-DC high-efficiency power supply with PFC AC Voltage 100-240V, 50-60 Hz, 10 - 4 Amp +5V 30 Amp, +5V standby 4 Amp +12V 57 Amp, -12V 0.6 Amp, +3.3V 24 Amp
Regulatory (Power Supply/Safety/EMC)	USA - UL listed, FCC Canada - CUL listed Germany - TUV Certified EN 60950/IEC 60950-Compliant CB report CCC Certification
Front Panel	Buttons: Power On/Off, System Reset, LEDs: Power supply failure, System overheat, 2x Network activity, Hard drive activity, power supply (see Figure 2)
Ports	2 1Gb Ethernet ports (WAN) 2, 4, 6 or 8 SAN ports 2 PS-2 for keyboard 2 USB for keyboard 1 Serial 1 VGA See Figure 3.

Precautions

Inspect the box

You should inspect the box the chassis was shipped in and note if it was damaged in any way. If the chassis itself shows damage, file a damage claim with the carrier who delivered your system.

Decide on a suitable location for the rack unit that will hold that chassis. It should be situated in a clean, dust-free area that is well ventilated. Avoid areas where heat, electrical noise and electromagnetic fields are generated.

You will also need to place it near at least one grounded power outlet. The VSX chassis includes one power supply.

Electrical precautions

Basic electrical safety precautions should be followed to protect yourself from harm and the VSX from damage:

- Be aware of the locations of the power on/off switch on the chassis as well as the room's emergency power-off switch, disconnection switch or electrical outlet. If an electrical accident occurs, you can then quickly remove power from the system.

- Do not work alone when working with high-voltage components.

- Power should always be disconnected from the system when removing or installing main system components. When disconnecting power, you should first power down the system with the operating system and then unplug the power cords from all the power supply modules in the system.

- When working around exposed electrical circuits, another person who is familiar with the power-off controls should be nearby to switch off the power, if necessary.

- Use only one hand when working with powered-on electrical equipment. This is to avoid making a complete circuit, which will cause electrical shock. Use extreme caution when using metal tools, which can easily damage any electrical components or circuit boards they come into contact with.

- Do not use mats designed to decrease electrostatic discharge as protection from electrical shock. Instead, use rubber mats that have been specifically designed as electrical insulators.

- The power supply power cord must include a grounding plug and must be plugged into grounded electrical outlets.

General safety precautions

- Keep the area around the chassis clean and free of clutter.

- Place the chassis top cover and any system components that have been removed away from the system or on a table so that they won't accidentally be stepped on.

- While working on the system, do not wear loose clothing such as neckties and unbuttoned shirt sleeves, which can come into contact with electrical circuits or be pulled into a cooling fan.

- Remove any jewelry or metal objects from your body, which are excellent metal conductors that can create short circuits and harm you if they come into contact with printed circuit boards or areas where power is present.

- After accessing the inside of the system, close the system back up and secure it to the rack unit with the retention screws after ensuring that all connections have been made.

System safety

Electrostatic discharge (ESD) is generated by two objects with different electrical charges coming into contact with each other. An electrical discharge is created to neutralize this difference, which can damage electronic components and printed circuit boards. The following measures are generally sufficient to neutralize this difference before contact is made to protect your equipment from ESD:

- Do not use mats designed to decrease electrostatic discharge as protection from electrical shock. Instead, use rubber mats that have been specifically designed as electrical insulators.

- Use a grounded wrist strap designed to prevent static discharge.

- Keep all components and printed circuit boards (PCBs) in their antistatic bags until ready for use.

- Touch a grounded metal object before removing any board from its antistatic bag.

- Do not let components or PCBs come into contact with your clothing, which may retain a charge even if you are wearing a wrist strap.

- Handle a board by its edges only; do not touch its components, peripheral chips, memory modules or contacts.

- When handling chips or modules, avoid touching their pins. Put the serverboard and peripherals back into their antistatic bags when not in use.

- For grounding purposes, make sure your computer chassis provides excellent conductivity between the power supply, the case, the mounting fasteners and the serverboard.

Contacting Coraid Technical Support

Technical support

Do you have more questions? See the Coraid Support web site:

http://www.coraid.com/support/

Contact the Coraid Technical Assistance Center at:

support@coraid.com

To help the Technical Assistance Center diagnose your problem, send diagnostic output along with a description of your problem. To obtain diagnostic output, issue the sos command.

Policy Statements, Warranty, and EULA

Click the following link for the Coraid End User License Agreement:

http://san.coraid.com/rs/coraid/images/Coraid_EULA.pdf

Warranty and return policy

CAUTION: If the product includes hard disk drives, do not ship the product with hard disk drives installed! Doing so may damage the product and void the warranty!

Unless other Warranty provisions have been provided in a separate purchase contract, this Limited Warranty shall apply to all Coraid manufactured Products. Coraid Inc. ("Coraid") provides this Limited warranty to the entity that originally purchased the new Coraid Product, from Coraid or its authorized reseller.

Coraid's return policy is that all sales are final, with no refund or return provision, unless a prepaid 30-day money-back trial has been arranged prior to order shipment.

Limited hardware warranty

Coraid warrants that the Hardware portion of the Coraid Products described below will be free from material defects in workmanship and materials for the period of thirty six (36) months from the date of original purchase of the Product from Coraid or its authorized reseller ("Warranty Period").

Disk drives supplied by Coraid as marked and Certified disk drives may be returned to Coraid for repair or replacement during the Warranty Period. If the hard disk drives or solid state drives (SSDs) are properly used and installed in Coraid products, they will be free from defects in material and workmanship, and will substantially conform to the disk manufacturer's publicly available specifications for a period of three (3) years beginning on the date the Product was purchased. Coraid Products and Coraid Certified disks or SSDs used outside their published specifications, are not covered under this warranty.

Coraid's sole obligation shall be to repair or replace the defective Hardware during the Warranty Period at no charge to the original owner or to refund at Coraid's sole discretion. Such repair or replacement will be rendered by Coraid at Coraid's Service Center. The replacement Hardware need not be new nor have an identical make, model or part. Coraid may in its sole discretion replace the defective Hardware (or any part thereof) with any reconditioned product that Coraid reasonably determines is substantially equivalent (or superior) in all material respects to the defective Hardware. Repaired or replacement Hardware will be warranted for the remainder of the original Warranty Period from the date of original Product purchase from Coraid or its authorized reseller.

Submitting a claim

The customer shall obtain a Return Material Authorization ("RMA") number from Coraid service center and return the Product to Coraid. The customer must submit with the Product as part of the claim a written description of the hardware defect or Software nonconformance in sufficient detail to allow Coraid to confirm the same.

After an RMA number has been issued by Coraid, the defective Product must be packaged securely in suitable shipping package to ensure that it will not be damaged in transit, and the RMA number must be prominently marked on the outside of the package. The customer is responsible for all return shipping charges to Coraid, and Coraid will not be held responsible for any packages that are lost in transit to Coraid.

Return Product ship to address is:
Coraid Inc. c/o Creation Technologies, 2801 Northwestern Pkwy, Santa Clara, CA 95051

What is not covered

This limited warranty provided by Coraid does not cover repair of Products, if in Coraid's judgment, Product has been subjected to abuse, accident, alteration, modification, tampering, negligence, misuse, faulty installation, lack of reasonable care, repair or service in any way that is not contemplated in the documentation for the product. Damage that occurs in shipment, due to act of God, failures due to power surge, and cosmetic damage is not covered. Any hardware, software, firmware or other products or services provided by anyone other than Coraid is not covered. Loss of stored data for any reason is not covered under this Limited Warranty.

Disclaimer of other warranties

EXCEPT FOR THE LIMITED WARRANTY SPECIFIED HEREIN, THE PRODUCT IS PROVIDED "AS-IS" WITHOUT ANY WARRANTY OF ANY KIND WHATSOEVER INCLUDING, WITHOUT LIMITATION, ANY WARRANTY OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NON-INFRINGEMENT. IF ANY IMPLIED WARRANTY CANNOT BE DISCLAIMED IN ANY TERRITORY WHERE A PRODUCT IS SOLD, THE DURATION OF SUCH IMPLIED WARRANTY SHALL BE LIMITED TO NINETY (90) DAYS. EXCEPT AS EXPRESSLY COVERED UNDER THE LIMITED WARRANTY PROVIDED HEREIN, THE ENTIRE RISK AS TO THE QUALITY, SELECTION AND PERFORMANCE OF THE PRODUCT IS WITH THE PURCHASER OF THE PRODUCT.

Limitation of liability

TO THE MAXIMUM EXTENT PERMITTED BY LAW, CORAID IS NOT LIABLE UNDER ANY CONTRACT, NEGLIGENCE, STRICT LIABILITY OR OTHER LEGAL OR EQUITABLE THEORY FOR ANY LOSS OF USE OF THE PRODUCT, INCONVENIENCE OR DAMAGES OF ANY CHARACTER, WHETHER DIRECT, SPECIAL, INCIDENTAL OR CONSEQUENTIAL (INCLUDING, BUT NOT LIMITED TO, DAMAGES FOR LOSS OF GOODWILL, LOSS OF REVENUE OR PROFIT, WORK STOPPAGE, COMPUTER FAILURE OR MALFUNCTION, FAILURE OF OTHER EQUIPMENT OR COMPUTER PROGRAMS TO WHICH CORAID'S PRODUCT IS CONNECTED, LOSS OF INFORMATION OR DATA CONTAINED IN, STORED ON, OR INTEGRATED WITH ANY PRODUCT RETURNED TO CORAID FOR WARRANTY SERVICE) RESULTING FROM THE USE OF THE PRODUCT, RELATING TO WARRANTY

SERVICE, OR ARISING OUT OF ANY BREACH OF THIS LIMITED WARRANTY, EVEN IF CORAID HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. THE SOLE REMEDY FOR A BREACH OF THE FOREGOING LIMITED WARRANTY IS REPAIR, REPLACEMENT OR REFUND OF THE DEFECTIVE OR NON-CONFORMING PRODUCT. THE MAXIMUM LIABILITY OF CORAID UNDER THIS WARRANTY IS LIMITED TO THE PURCHASE PRICE OF THE PRODUCT COVERED BY THE WARRANTY. THE FOREGOING EXPRESS WRITTEN WARRANTIES AND REMEDIES ARE EXCLUSIVE AND ARE IN LIEU OF ANY OTHER WARRANTIES OR REMEDIES, EXPRESS, IMPLIED OR STATUTORY.

Governing law

This Limited Warranty shall be governed by the laws of the State of Georgia. Some states do not allow exclusion or limitation of incidental or consequential damages, or limitations on how long an implied warranty lasts, so the foregoing limitations and exclusions may not apply. This limited warranty provides specific legal rights and the product owner may also have other rights which vary from state to state.

Additional Safety Information

WARNING: Read the installation instructions before connecting the system to the power source.

ATTENTION: Avant de brancher le système sur la source d'alimentation, consulter les directives d'installation.

WARNUNG: Vor dem Anschließen des Systems an die Stromquelle die Installationsanweisungen lesen.

Lithium battery notice for service personnel

This product contains a lithium battery. Although the battery is not field-serviceable, observe the following warning:

CAUTION: Danger of explosion if battery is replaced with incorrect type. Replace only with the same type recommended by the manufacturer. Dispose of used batteries according to the manufacturer's instructions.

ATTENTION: II y a danger d'explosion s'il a remplacement incorrect de la batterie. Remplacer uniquement avec une batterie du meme type ou d'un type equivalent recommande par le constructeur. Mettre au rebut les batteries usagees conformement aux instructions du fabricant.

WARNUNG: Bei Einsetzen einer falschen Batterie besteht Explosionsgefahr. Ersetzen Sie die Batterie nur durch den gleichen oder vom Hersteller empfohlenen Batterietyp. Entsorgen Sie die benutzten Batterien nach den Anweisungen des Herstellers.

Dual power supply notice

WARNING: This unit has more than one power supply connection; all connections must be removed to remove all power from the unit.

WARNUNG: Diese Einheit verfügt über mehr als einen Stromanschluß; um Strom gänzlich von der Einheit fernzuhalten, müssen alle Stromzufuhren abgetrennt sein.

ATTENTION: Cette unité est équipée de plusieurs raccordements d'alimentation. Pour supprimer tout courant électrique de l'unité, tous les cordons d'alimentation doivent être débranchés.

WARNING: This product relies on the building's installation for shortcircuit (over current) protection. Ensure that a fuse or circuit breaker no larger than 120 VAC, 15 A U.S. (240 VAC, 10 A international) is used on the phase conductors (all current carrying conductors).

ATTENTION: Pour ce qui est de la protection contre les courts-circuits (surtension), ce produit dépend de l'installation électrique du local. Vérifier qu'un fusible ou qu'un disjoncteur de 120 V alt., 15 A U.S. maximum (240 V alt., 10 A international) est utilisé sur les conducteurs de phase (conducteurs de charge).

WARNUNG: Dieses Produkt ist darauf angewiesen, daß im Gebäude ein Kurzschluß- bzw. Überstromschutz installiert ist. Stellen Sie sicher, daß eine Sicherung oder ein Unterbrecher von nicht mehr als 240 V Wechselstrom, 10 A (bzw. in den USA 120 V Wechselstrom, 15 A) an den Phasenleitern (allen stromführenden Leitern) verwendet wird.

Laser warning

WARNING: Class 1 Laser product.

ATTENTION: Produit laser de classe 1

WARNUNG: Laserprodukt der Klasse 1

EtherDrive equipment is intended for installation in restricted access areas.

Mounting the unit

WARNING: To prevent bodily injury when mounting or servicing this unit in a rack, you must take special precautions to ensure that the system remains stable. These guidelines are provided to ensure your safety:

- This unit should be mounted at the bottom of the rack if it is the only unit in the rack.

- When mounting this unit in a partially filled rack, load the rack from the bottom to the top with the heaviest component at the bottom of the rack.

- If the rack is provided with stabilizing devices, install the stabilizers before mounting or servicing the unit in the rack.

ATTENTION: Pour éviter toute blessure corporelle pendant les opérations de montage ou de réparation de cette unité en casier, il convient de prendre des précautions spéciales afin de maintenir la stabilité du système. Les directives ci-dessous sont destinées à assurer la protection du personnel.

- Si cette unité constitue la seule unité montée en casier, elle doit être placée dans le bas.

- Si cette unité est montée dans un casier partiellement rempli, charger le casier de bas en haut en plaçant l'élément le plus lourd dans le bas.

- Si le casier est équipé de dispositifs stabilisateurs, installer les stabilisateurs avant de monter ou de réparer l'unité en casier.

WARNUNG: Zur Vermeidung von Körperverletzung beim Anbringen oder Warten dieser Einheit in einem

Gestell müssen Sie besondere Vorkehrungen treffen, um sicherzustellen, daß das System stabil bleibt. Die folgenden Richtlinien sollen zur Gewährleistung Ihrer Sicherheit dienen:

- Wenn diese Einheit die einzige im Gestell ist, sollte sie unten im Gestell angebracht werden.

- Bei Anbringung dieser Einheit in einem zum Teil gefüllten Gestell ist das Gestell von unten nach oben zu laden, wobei das schwerste Bauteil unten im Gestell anzubringen ist.

- Wird das Gestell mit Stabilisierungszubehör geliefert, sind zuerst die Stabilisatoren zu installieren, bevor Sie die Einheit im Gestell anbringen oder sie warten.

Regulatory certifications

United States FCC statement

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Canada compliance statement (Industry Canada)

This Class [A] digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la classe [A] respecte toutes les exigences du Réglement sur le matériel brouilleur du Canada.

Safety standards

- UL 60950-1: 2007
- CAN/CSA C22.2 No. 60950-1-07
- EN60950-1: 2006 +A11: 2009
- Emissions Standards: FCC Part 15B Class A
- EN 55022: 2006 plus A1:2007
- EN 61000-3-2: 2006
- EN 61000-3-3: 2008
- EN 55024: 1998 plus A1:2001 & A2:2003
- Australian/New Zealand Standard AS/NZS CISPR 22: 2009

European Union (CE) Statement

This product is in conformity with the essential requirements of the following EU directives:

- 2004/108/EC — Electromagnetic Compatibility Directive (EMC)
- 2006/95/EC — Low Voltage Directive (LVD)