SANworks by Compaq

HSV Element Manager for Enterprise Virtual Array
Reference Guide

Part Number: AA-RQZBC-TE

Third Edition (July 2002)

Product Version: 2.0

This reference guide explains how to set up the *SANworks*™ HSV Element Manager by Compaq and use it to configure, manage, and monitor your SANworks Enterprise Virtual Array by Compaq storage system.

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HSV Element Manager for Enterprise Virtual Array Reference Guide
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Contents

About this Guide

Intended Audience ix
Related Documentation ix
Prerequisites ix
Document Conventions x
Symbols in Text x
Symbols on Equipment xi
Rack Stability xii
Getting Help xii
Compaq Technical Support xii
Compaq Website xiii
Compaq Authorized Reseller xiii

1 Introduction

Features and Capabilities 1–2
Enterprise Virtual Array Storage System 1–3
Virtualization 1–4
Storage System Operation 1–5

2 Getting Started with the HSV Element Manager

Installing the HSV Element Manager 2–1
Navigating the Open SAN Manager Home Page 2–2
Launching the HSV Element Manager 2–4
Quick Launching the HSV Element Manager 2–7
Setting up the HSV Element Manager 2–8
Rediscovering Storage Systems 2–9
Establishing Storage System Access 2–9
Enabling Password Protection on a Storage System 2–11
Changing a Storage System Password 2–13
Deleting a Storage System Password 2–14

Licensing 2–15
License Keys 2–15
Accessing and Viewing Licensing Options 2–16
Viewing License Keys 2–16
Entering or Adding a License Key 2–17
Setting User Interface Options 2–18
Setting Page Footer Message Options 2–20
Setting Display Refresh Options 2–20
Initializing the Storage System 2–21
Using Storage System Initialization Advanced Options 2–23

3 Configuring and Managing the Storage System

Working with Disk Groups 3–1
Creating Disk Groups 3–7
Using the Create a Disk Group Advanced Options 3–8
Adding Disks to a Disk Group 3–10
Modifying a Disk Group 3–10
Deleting a Disk Group 3–11
Working with Virtual Disks 3–11
Working with Active Members of a Virtual Disk Family 3–12
Creating a Virtual Disk Family 3–17
Modifying a Virtual Disk 3–18
Deleting a Virtual Disk Family 3–19
Working with Snapshots 3–20
Creating a Snapshot 3–27
Using the Snapshot Advanced Options 3–29
Modifying Snapshot Properties 3–31
Deleting a Snapshot 3–32
Working with Virtual Disks 3–32
Presenting a Virtual Disk to a Host 3–33
Using Advanced Options on the Present a Virtual Disk Page 3–34
Unpresenting a Virtual Disk 3–35
Working with Snapclones 3–36
Creating a Snapclone 3–36
Using the Create a Virtual Disk Snapclone Advanced Options 3–37
Modifying a Snapclone Virtual Disk 3–42
Working with Hosts 3–43
Adding a Host 3–46

Deleting a Host 3–48
Modifying Host Properties 3–48
Working with Ports 3–49
Adding a Port 3–49
Deleting a Port 3–50

4 Monitoring the Storage System

SNMP-Enabled Hosts 4–1
SNMP Traps 4–2
SNMP Trap Events 4–2
Storage System Spontaneous System Event Traps 4–2
Disk Enclosure Event Traps 4–3
Management Agent Event Trap 4–3
Management Agent Events 4–4
Logging Management Agent Events 4–4
Filtering Events in the Management Agent Event Log 4–6
Controller Events 4–7
Disk Enclosure Events 4–9
Termination Events 4–9
Viewing Events 4–11
System Time and Date 4–12
Event Parse File 4–14
Event Information Packet Type 4–14
Setting System Operational Policies 4–15
Event Notification File 4–16
Configuring an Event Notification File 4–16
Configure Events Individually 4–19
Configuring Events Using a Configuration File 4–21
Copying an Event Notification file to Another Storage System 4–21
Host Notification File 4–22
Configuring a Host Notification File 4–22
Copying the Host Notification File to Another Storage System 4–23
Changing the Host Notification List 4–24
Modifying the Host Notification List 4–24
Adding an Entry to the Host Notification List 4–25
Deleting an Entry from the Host Notification List 4–26

Glossary

Index

Figures

1–1 Enterprise Virtual Array storage system example . . . 1–2
1–2 Basic storage system components . . . 1–4
1–3 Traditional RAID versus Enterprise Virtual Array virtualization . . . 1–5
1–4 Block diagram of the storage system connections . . . 1–6
2–1 OSM home page . . . 2–2
2–2 Resource Managers page . . . 2–4
2–3 HSV Storage Systems Summary page . . . 2–5
2–4 HSV Storage System Network Properties page . . . 2–6
2–5 Resource Managers Quick Launch page . . . 2–7
2–6 Management Agent Options page . . . 2–8
2–7 Storage System Access Management Options screen . . . 2–10
2–8 Add a Storage System Password page . . . 2–12
2–9 Change Storage System Password page . . . 2–13
2–10 Delete Storage System(s) page . . . 2–14
2–11 Licensing Options page . . . 2–16
2–12 View Licenses page . . . 2–17
2–13 Add a License page . . . 2–18
2–14 User Interface Options page . . . 2–19
2–15 Set User Interface Security Message page . . . 2–20
2–16 Display Refresh Options page . . . 2–21
2–17 Uninitialized HSV Storage System Properties page . . . 2–22
2–18 Initialize an HSV Storage System page . . . 2–23
2–19 Page 2 of the Initialize an HSV Storage System page . . . 2–24
2–20 Page 3 of the Initialize an HSV Storage System page . . . 2–25
2–21 Page 4 of the Initialize an HSV Storage System page . . . 2–26
3–1 Disk Group Folder Properties page . . . 3–2
3–2 Disk Group Properties page . . . 3–4
3–3 Create a Disk Group page . . . 3–8
3–4 Page 2 of the Create a Disk Group page . . . 3–8
3–5 Page 3 of the Create a Disk Group page . . . 3–9
3–6 Add Disks to Disk Group page . . . 3–10
3–7 Virtual Disk Folder Properties page . . . 3–13
3–8 Virtual Disk Family Properties page . . . 3–14

3–9 Create a Virtual Disk Family page 3–17
3–10 Virtual Disk Snapshot Properties page 3–21
3–11 Virtual Disk Active Properties page 3–28
3–12 Page 1, Create a Virtual Disk Snapshot 3–28
3–13 Page 2, Create a Virtual Disk Snapshot 3–29
3–14 Page 3, Create a Virtual Disk Snapshot 3–30
3–15 Page 4, Create a Virtual Disk Snapshot 3–30
3–16 Page 5, Create a Virtual Disk Snapshot 3–31
3–17 Virtual Disk Active Properties page 3–33
3–18 Page 1, Present Virtual Disk 3–34
3–19 Page 2, Present Virtual Disk 3–34
3–20 Delete Virtual Disk Presentation page 3–35
3–21 Page 1 of the Create a Snapclone page 3–37
3–22 Page 2 of the Create a Snapclone page 3–38
3–23 Page 3 of the Create a Snapclone page 3–39
3–24 Page 4 of the Create a Snapclone page 3–40
3–25 Page 5 of the Create a Snapclone page 3–41
3–26 Virtual Disk Family Properties page. 3–42
3–27 Host Folder Properties page 3–43
3–28 Host Properties page 3–44
3–29 Page 1, Add a Host 3–46
3–30 Page 2, Add a Host 3–47
3–31 Page 3, Add a Host 3–47
3–32 Add a Host Port page 3–49
3–33 Delete a Host Port page. 3–50
4–1 Management Agent Events log page 4–5
4–2 Filtering Events page 4–6
4–3 Controller Events log page 4–8
4–4 Termination Events – Controller log page 4–10
4–5 Event Display 4–11
4–6 System Options page. 4–12
4–7 Set System Time page. 4–13
4–8 Set System Operational Policies page. 4–16
4–9 Initialized Storage System Properties page. 4–17
4–10 Set Event Notifications Options page 4–18
4–11 Set Event Options Individually page 4–20
4–12 Set Event Host Options page 4–23
4–13 Modify Host Notification List. 4–25

Tables

1 Document Conventions x
2–1 Open SAN Manager & HSV Element Manager Pane Descriptions 2–3
2–2 HSV Storage Systems Summary Page Field Descriptions 2–5
2–3 Management Agent Option Descriptions 2–8
2–4 Storage System Access Management Options 2–11
2–5 License Key Type Description 2–15
2–6 Licensing Options 2–16
2–7 User Interface Options Page Descriptions 2–19
2–8 Display Refresh Option Descriptions 2–21
2–9 Page 2 Initialize an HSV Storage System Descriptions 2–25
3–1 Disk Group Folder Property Descriptions 3–2
3–2 Disk Group Properties Page Description 3–5
3–3 Virtual Disk Folder Properties Page Descriptions 3–13
3–4 Virtual Disk Family Property Descriptions 3–15
3–5 Virtual Disk Snapshot Properties Description 3–22
3–6 Host Folder Property Descriptions 3–44
3–7 Host Properties Page Descriptions 3–44
4–1 Storage System Spontaneous Event Field Descriptions 4–2
4–2 Disk Enclosure Event Field Descriptions 4–3
4–3 Management Agent Event Trap Field Descriptions 4–4
4–4 Management Agent Events Log Heading Descriptions 4–5
4–5 Management Agent Event Filter Descriptions 4–7
4–6 Controller Events Page Headings Description 4–8
4–7 Termination Event Log Heading Descriptions 4–10
4–8 Event Information Packet (EIP) Type 4–14

About this Guide

The SANworks by Compaq HSV Element Manager for Enterprise Virtual Array Reference Guide provides information to help you use the HSV Element Manager to:

- Set up, manage, and monitor your storage system
- Contact technical support for additional assistance.

Intended Audience

This book is intended for use by those who will be setting up and managing an Enterprise Virtual Array storage system and are experienced with the following:

- Storage systems
- Storage databases

Related Documentation

In addition to this guide, Compaq provides corresponding information:

- *SANworks by Compaq Management Appliance Configuration Guid*e.
- *SANworks by Compaq Open SAN Manager User Guide*
- *StorageWorks by Compaq Enterprise Virtual Array User Guide*

Prerequisites

Before you can access the HSV Element Manager, make sure you consider these items:

- Storage system environment
- Storage Area Network (SAN) design

Document Conventions

The conventions included in Table 1 apply in most cases.

Table 1: Document Conventions

Element	Convention
Key names, menu items, buttons, and dialog box titles	**Bold**
File names and application names	*Italics*
User input, command names, system responses (output and messages)	`Monospace font` `COMMAND NAMES` are uppercase unless they are case sensitive
Variables	*`Monospace, italic font`*
Website addresses	Sans serif font (http://www.compaq.com)

Symbols in Text

These symbols may be found in the text of this guide. They have the following meanings:

WARNING: Text set off in this manner indicates that failure to follow directions in the warning could result in bodily harm or loss of life.

CAUTION: Text set off in this manner indicates that failure to follow directions could result in damage to equipment or data.

IMPORTANT: Text set off in this manner presents clarifying information or specific instructions.

NOTE: Text set off in this manner presents commentary, sidelights, or interesting points of information.

Symbols on Equipment

Any enclosed surface or area of the equipment marked with these symbols indicates the presence of electrical shock hazards. Enclosed area contains no operator serviceable parts.

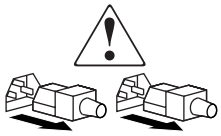
WARNING: To reduce the risk of injury from electrical shock hazards, do not open this enclosure.

Any RJ-45 receptacle marked with these symbols indicates a network interface connection.

WARNING: To reduce the risk of electrical shock, fire, or damage to the equipment, do not plug telephone or telecommunications connectors into this receptacle.

Any surface or area of the equipment marked with these symbols indicates the presence of a hot surface or hot component. Contact with this surface could result in injury.

WARNING: To reduce the risk of injury from a hot component, allow the surface to cool before touching.



Power supplies or systems marked with these symbols indicate the presence of multiple sources of power.

WARNING: To reduce the risk of injury from electrical shock, remove all power cords to completely disconnect power from the power supplies and systems.

Any product or assembly marked with these symbols indicates that the component exceeds the recommended weight for one individual to handle safely.

WARNING: To reduce the risk of personal injury or damage to the equipment, observe local occupational health and safety requirements and guidelines for manually handling material.

Rack Stability

WARNING: To reduce the risk of personal injury or damage to the equipment, be sure that:

- **The leveling jacks are extended to the floor.**
- **The full weight of the rack rests on the leveling jacks.**
- **In single rack installations, the stabilizing feet are attached to the rack.**
- **In multiple rack installations, the racks are coupled.**
- **Only one rack component is extended at any time. A rack may become unstable if more than one rack component is extended for any reason.**

Getting Help

If you still have a question after reading this guide, contact service representatives or visit our website.

Compaq Technical Support

In North America, call Compaq technical support at 1-800-354-9000, available 24 hours a day, 7 days a week.

NOTE: For continuous quality improvement, calls may be recorded or monitored.

Outside North America, call Compaq technical support at the nearest location. Telephone numbers for worldwide technical support are listed on the Compaq website: http://www.compaq.com.

Be sure to have the following information available before calling:

- Technical support registration number (if applicable)
- Product serial numbers
- Product model names and numbers
- Applicable error messages
- Operating system type and revision level
- Detailed, specific questions

Compaq Website

The Compaq website has the latest information on this product, as well as the latest drivers. Access the Compaq website at: http://www.compaq.com/storage. From this website, select the appropriate product or solution.

Compaq Authorized Reseller

For the name of your nearest Compaq Authorized Reseller:

- In the United States, call 1-800-345-1518.
- In Canada, call 1-800-263-5868.
- Elsewhere, see the Compaq website for locations and telephone numbers.

1

Introduction

The HSV Element Manager is the Graphical User Interface (GUI) for the Enterprise Virtual Array (also called the Enterprise Storage System). The HSV Element Manager provides the features that enable virtualization technology and the management interface for the Enterprise Virtual Array environment as follows:

- The HSV Element Manager software centrally configures, manages, and monitors the Enterprise Storage System.
- The HSV Element Manager installs on and runs via the Open SAN Manager (OSM) on the *SANworks* ™ Management Appliance by Compaq and is accessed by a web browser (see the *SANworks by Compaq Management Appliance Configuration Guide* provided with the Management Appliance for more information). The Management Appliance is attached to the storage area fabric where the hosts and storage system reside.

Figure 1–1 shows an example of the HSV Element Manager as a part of the Enterprise Virtual Array storage system environment.

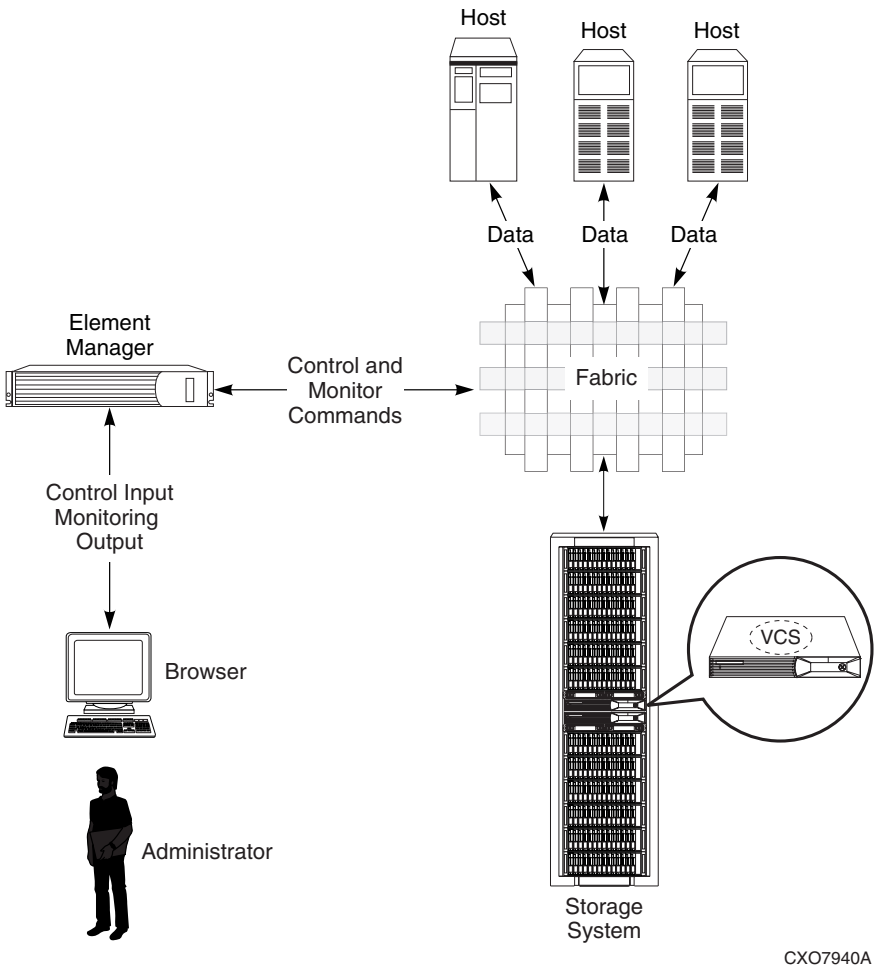


Figure 1–1: Enterprise Virtual Array storage system example

Features and Capabilities

The HSV Element Manager supports physical and logical views of the storage system.

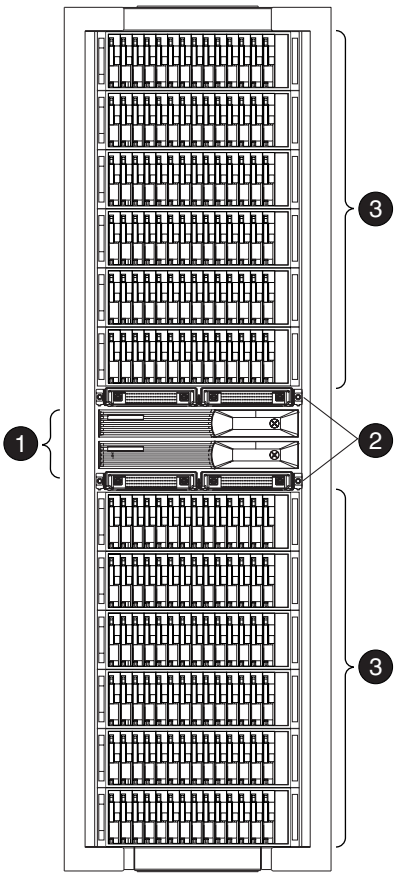
The HSV Element Manager maintains a database for each storage system that it manages. This database resides on the respective storage system and is accessible only through the HSV Element Manager.

NOTE: Each installation of the HSV Element Manager is referred to as a management agent.

Enterprise Virtual Array Storage System

The storage system consists of a pair of HSV controllers and their array of physical disk drives (see Figure 1–2). The physical disk drives plug into disk drive enclosures and the controller pair is cabled to the disk drive enclosures. A backplane in each disk drive enclosure distributes commands and data to the drives.

The Enterprise Virtual Array is managed by centralized software that allows an administrator to configure storage for numerous host computers. The management software or element manager creates virtual disks and presents them to one or more hosts. The host views the virtual disk just as it views any ordinary disk drive.



❶ Controller pair
❷ FC loop switches
❸ FC drive enclosures

Figure 1–2: Basic storage system components

Virtualization

The Enterprise Storage System uses virtualization technology whereby physical disks are organized into disk groups (see Figure 1–3). A disk group is a pool from which the administrator allocates the capacity and data protection characteristics of a virtual

disk. The controller presents the virtual disk as a logical unit number (LUN) to a host for application use. These virtual disks are created using the capacity of all drives in a disk group.

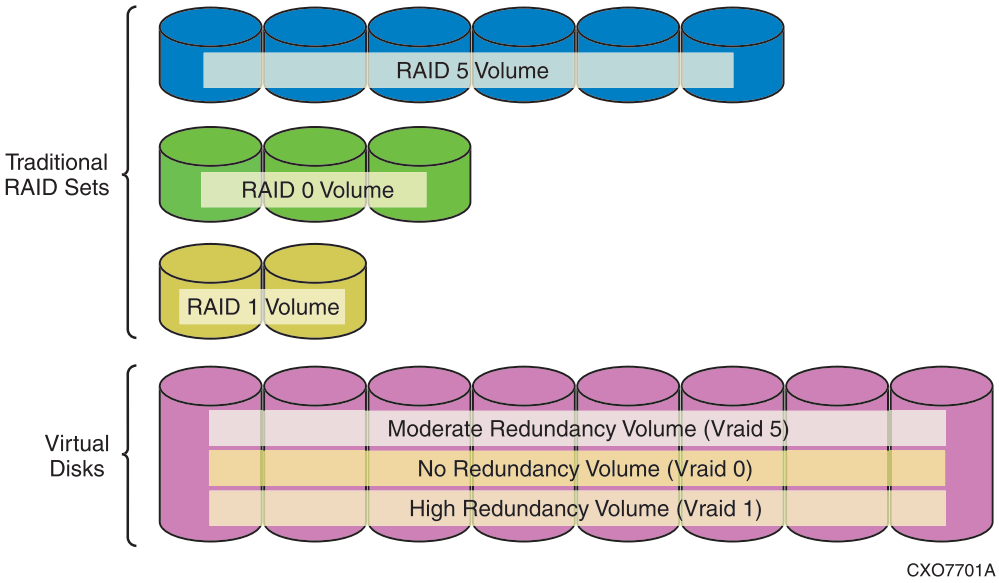


Figure 1–3: Traditional RAID versus Enterprise Virtual Array virtualization

Storage System Operation

Figure 1–4 shows a block diagram of an entire storage system where:

- The controller pair connects to the two Fibre Channel fabrics to which the hosts connect.
- The HSV Element Manager is the software that resides on the Management Appliance that controls the storage system.
- The controller pair connects to the physical disk array through Fibre Channel cables and through two arbitrated loops: loop pair 1 and loop pair 2. Each loop pair consists of 2 loops, each running independently. Each loop, however, can take over for the other in case of failure.

  NOTE: For more information, see the *Compaq StorageWorks Enterprise Virtual Array User Guide* included with the Enterprise Virtual Array.

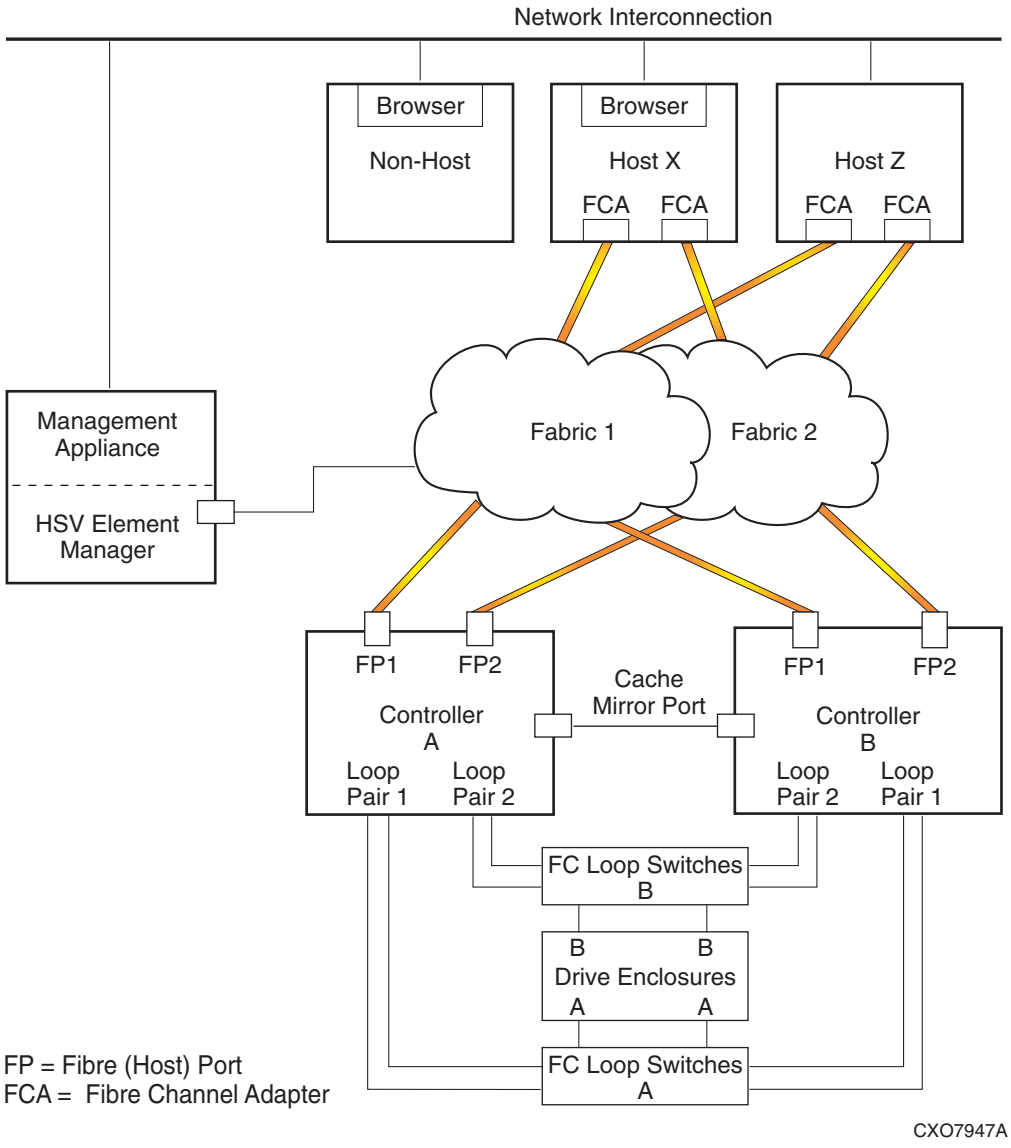


Figure 1–4: Block diagram of the storage system connections

2

Getting Started with the HSV Element Manager

The first thing you must do is install the HSV Element Manager on the Management Appliance via Open SAN Manager (OSM.) Access OSM through a supported internet browser on the same network as the Management Appliance. The *SANworks by Compaq Management Appliance Configuration Guide* provides information on which browsers and browser versions are supported.

NOTE: Information on getting your Management Appliance operational and logging onto OSM is provided in the Management Appliance documentation.

This chapter contains information that will enable you to set up your HSV Element Manager. It provides instructions and information on the following HSV Element Manager tasks:

- Installing the HSV Element Manager
- Navigating the Open SAN Manager Home Page
- Launching the HSV Element Manager
- Setting up the HSV Element Manager
- Initializing the Storage System

Follow the steps in each section. After completing the steps, you can manage your storage systems with the functionality provided by the HSV Element Manager.

Installing the HSV Element Manager

The *SANworks by Compaq Management Appliance Update Installation Card* that comes with the *SANworks by Compaq Management Appliance March 2002 Update* provides step-by-step instructions for HSV Element Manager installation. When the installation is complete, follow the Management Appliance documentation to access OSM from which HSV Element Manager is launched.

NOTE: For the latest information on the Management Appliance, refer to the Compaq website at: http://www.compaq.com.

Navigating the Open SAN Manager Home Page

The **OSM** home page (see Figure 2–1) displays when you open OSM from the **Management Appliance** home page.

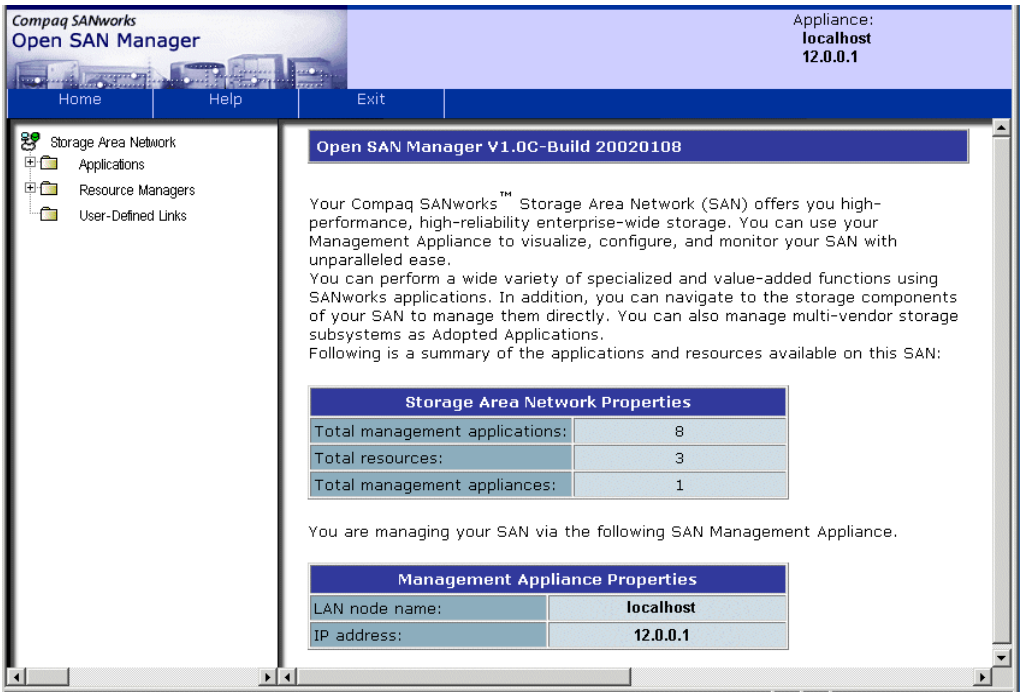


Figure 2–1: OSM home page

The **OSM** and the **HSV Element Manager** home pages are divided into three panes. These panes are described in Table 2–1.

Table 2–1: Open SAN Manager & HSV Element Manager Pane Descriptions

Name	Location	Description

Session pane	Top part of the page with application name and tool bar	• Provides information about the specific element manager to which you are connected.
		• Provides the LAN name and IP address of the Management Appliance that is running the management agent in the top right corner.
		• Provides a toolbar, which typically displays the following items:
		  • Home–Displays the root navigation tree and property page.
		  • Help – Opens an online help window.
		  • Exit – Closes the HSV Element Manager window.
		  • Options – Displays options that affect the actions, attributes, and appearance of the management agent. Options available are Rediscover storage systems, Storage system access, Licensing options, User interface options, Page footer message options, and Display refresh.

Navigation pane	The lower left portion of the screen	• Provides an expandable tree of folders that represent the logical structure of the storage system. • Provides access to storage system elements.
Content pane	The lower right portion of the screen	• Provides information about the storage system element or folder selected in the Navigation pane. • Allows you to manage the systems and system objects in the Navigation pane.

Launching the HSV Element Manager

Two options are available to launch the HSV Element Manager from OSM:

- From the **HSV Storage Systems Summary** page
- From the **Resource Monitors** page **Quick Launch** buttons

You may want to use the **HSV Element Manager Summary** page method the first time for informational purposes. For quicker access, use the Quick Launch method.

To launch the HSV Element Manager from the **HSV Storage Systems Summary** page perform the following steps:

1. From the **OSM** home page **Navigation** pane, expand the **Resource Managers** folder and then the **Element Manager** folder.

   When expanded, the **Element Manager** folder displays the element managers installed on the Management Appliance, including the HSV Element Manager. (see Figure 2–2).

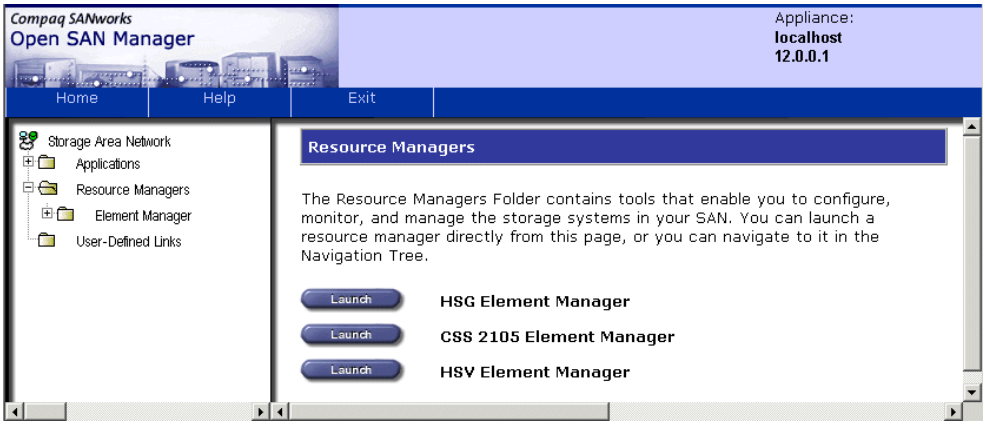


Figure 2–2: Resource Managers page

2. Click the **HSV Element Manager** icon to display the **HSV Storage Systems Summary** page (see Figure 2–3).

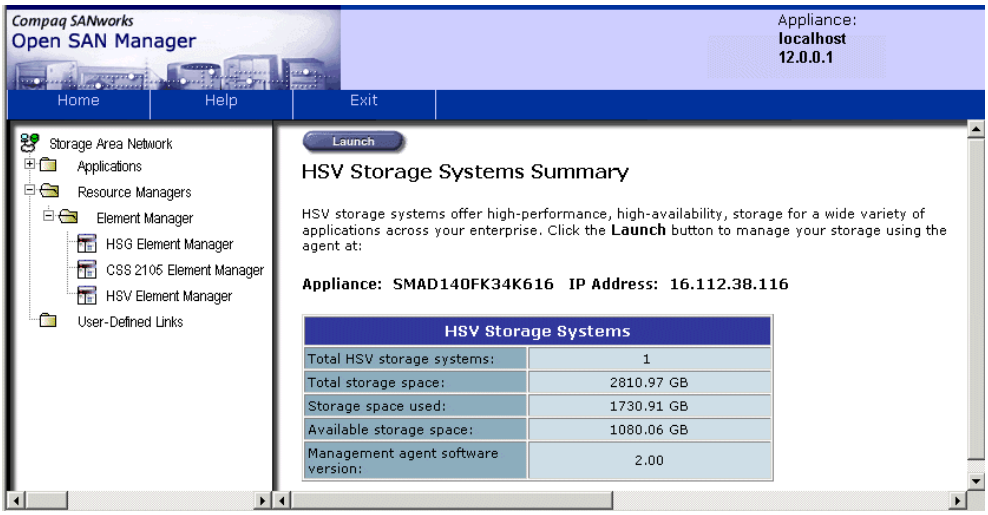


Figure 2–3: HSV Storage Systems Summary page

The **HSV Storage Systems Summary** page summarizes information regarding your storage systems. This page displays:

- Management Appliance Host name
- Management Appliance IP Addresses
- HSV Storage Systems properties

Table 2–2 provides HSV Storage Systems Summary page field descriptions.

Table 2–2: HSV Storage Systems Summary Page Field Descriptions

Storage System Property	Description
Total HSV storage systems	The number of storage systems visible to the HSV Element Manager (otherwise known as a management agent). Any systems with password-protected controllers not registered with the management agent are not visible.

Table 2–2: HSV Storage Systems Summary Page Field Descriptions (Continued)

Storage System Property	Description
Total storage space	The total storage space, in GB, of all the storage systems this management agent can see on the fabric, minus a small amount of space that the controllers and management agent uses for control and bookkeeping (metadata).
Storage space used	The total storage space used for host disks, in GB, of all the storage systems this management agent can see on the fabric.
Available storage space	The total storage space, in GB, minus storage space used of all the storage systems this management agent can see on the fabric. This value is the amount of storage space available for host disks.
Management agent software version	The agent software version currently residing on the Management Appliance.

3. Click **Launch** on the **HSV Storage System Summary** page.

The **HSV Storage System Network Properties** page (see Figure 2–4) displays.

NOTE: After the HSV Element Manager is launched, it is referred to as a management agent.

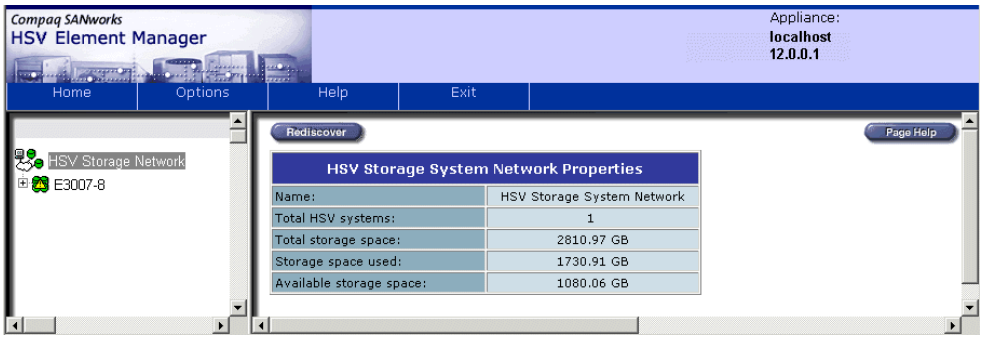


Figure 2–4: HSV Storage System Network Properties page

The HSV **Storage System Network Properties** page provides the following:

- A Storage Area Network tree displays in the **Navigation** pane that provides access to the storage area network subsystems and shows subsystem elements.

  NOTE: You can click on available storage systems in the **Navigation** pane. Refer to Chapter 3 for more details on creating disk groups and virtual disks.

- The HSV storage subsystem properties
- A **Rediscover** button (click to scan the network to update the Navigation tree).

  NOTE: Refer to "Navigating the Open SAN Manager Home Page" on page 2–2 for more details on other buttons appearing in the **Session** pane.

Quick Launching the HSV Element Manager

To quick launch the HSV Element Manager, perform the following steps:

1. From the **OSM** home page **Navigation** pane, click the **Resource Managers** folder icon.

   The **Resource Managers** page displays (see Figure 2–5) element managers and **Launch** buttons.

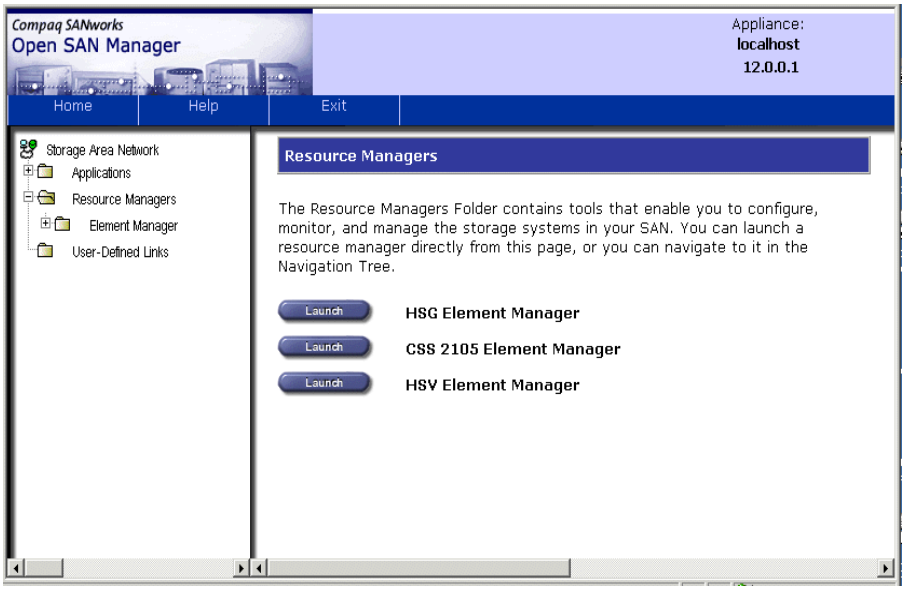


Figure 2–5: Resource Managers Quick Launch page

2. Click the HSV Element Manager **Launch** button.

The HSV Element Manager is launched in a separate browser window and the **HSV Storage System Network Properties** page displays (see Figure 2–4).

Setting up the HSV Element Manager

Before using the HSV Element Manager, set up the management agent options which control system attributes and behavior.

To access the management agent options, click the **Options** button on the **Session** pane toolbar. The **Management Agent Options** page displays (see Figure 2–6).

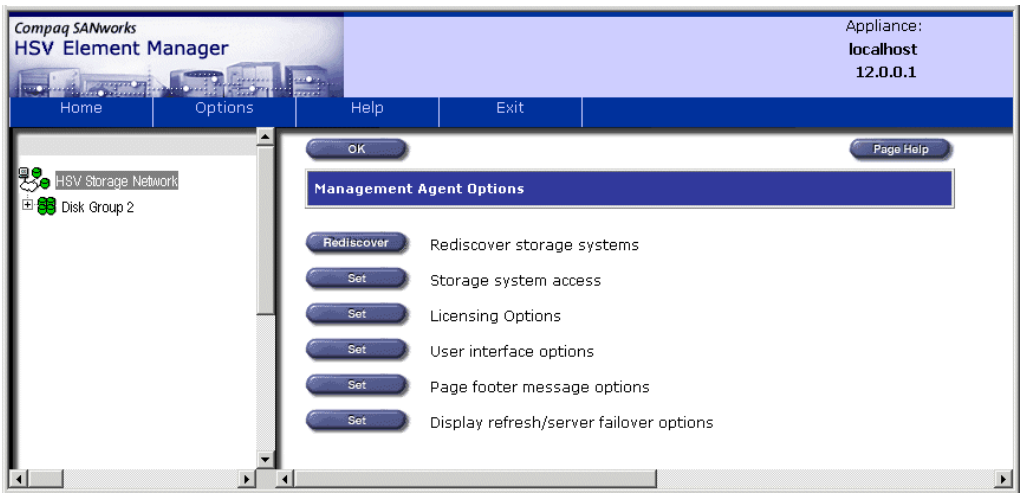


Figure 2–6: Management Agent Options page

Table 2–3 provides descriptions of the options available on the **Management Agent Options** page.

Table 2–3: Management Agent Option Descriptions

Option	Description
Rediscover storage systems	Instructs the management agent to look for new storage systems on the fabric.
Storage system access	Establishes password control for storage system access.
Licensing options	Add or display software license keys.

Table 2–3: Management Agent Option Descriptions (Continued)

Option	Description
User interface options	Establishes how the browser displays certain pages.
Page footer and message options	Allows you to display messages at the bottom of each **Content** pane.
Display page refresh options	Sets the time constraints for refreshing pages.

Rediscovering Storage Systems

The Rediscover option allows you to locate new storage systems on the SAN fabric.

To rediscover storage systems:

1. Click **Rediscover** on the **Management Agent Options** page (see Figure 2–6). A status page displays additional details.
2. Click **OK**.

   The updated **Navigation** pane displays any newly discovered storage systems.

Establishing Storage System Access

One management agent can control multiple storage systems but only one management agent can be active at a time. Without password protection, any management agent on the fabric can access any storage system on the fabric. Password protection allows a management agent to control only certain storage systems.

Storage system password protection is established by entering a password into the Operator Control Panel (OCP) of one of the controllers. To access a password-protected storage system, a management agent must match the password (see Figure 2–9). See the *StorageWorks by Compaq Enterprise Virtual Array User Guide* for more information.

NOTE: A password is a user-chosen, 8-digit alphanumeric sequence. See the *StorageWorks by Compaq Enterprise Virtual Array User Guide* for instructions on how to enter a password into an OCP.

IMPORTANT: Password protection is optional, but is recommended for complex fabrics where more than one management agent resides. A system that is not password-protected can be accessed by any management agent on the fabric. If password protection is not desired for a specific storage system, DO NOT enter a password into the operator control panel of either of the controllers.

To enable a specific management agent to access a specific storage system, perform the following steps:

1. Browse to that management agent.
2. Click **Options** in the **Session** pane.

   The **Management Agent Options** page (see Figure 2–6) displays.
3. Click the Storage System Access **Set** button.

   The **Storage System Access Management Options** page displays (see Figure 2–7). From this page, you can add, change, or delete storage systems from password protection.

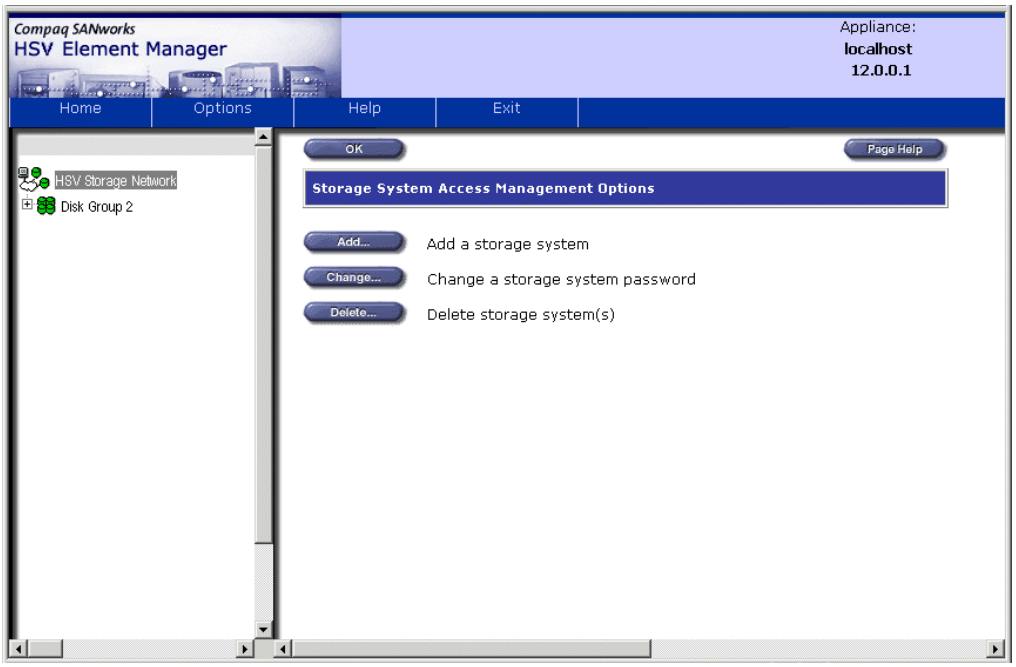


Figure 2–7: Storage System Access Management Options screen

Table 2–4 describes the options available on the **Storage System Access Management Options** page.

Table 2–4: Storage System Access Management Options

Option	Description
Add a storage system	Enables the management agent to access a specific storage system.
Change a storage system password	Enables you to enter a new password if the storage system's password is changed. This allows the management agent to continue to access the storage system.
Delete storage system(s)	Deletes a storage system from the list of storage systems that are visible to the management agent.

Enabling Password Protection on a Storage System

To add a storage system to password protection:

1. From the **Storage System Access Management Options** page, click **Add**.

The **Add a Storage System** page displays (see Figure 2–8).

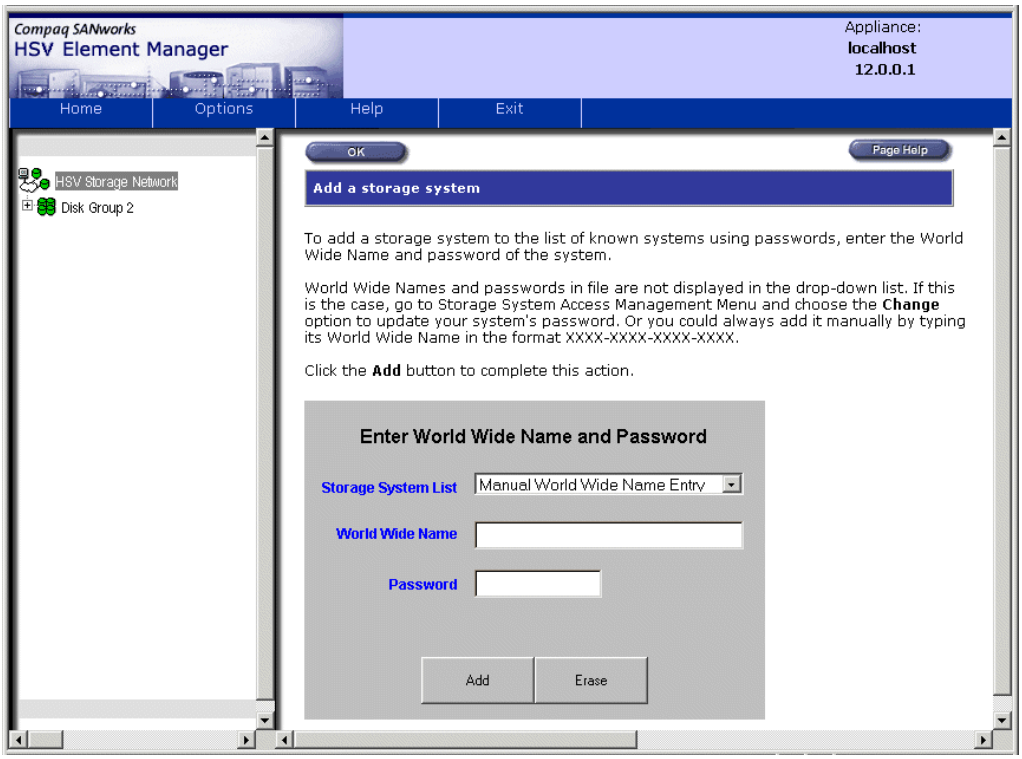


Figure 2–8: Add a Storage System Password page

2. Complete one of the following two options.
   - Choose a World Wide Name by using the drop-down menu in the **World Wide Name** field of the **Add a storage system** page. Doing so will automatically update the **World Wide Name** field.
   - Enter a new World Wide Name manually in the **World Wide Name** field.
3. Enter the system password.

   NOTE: This password should match the one set in the OCP.

   The **Confirm Action** pop-up displays.
4. Click **OK**.

   A status screen displays.

5. Click **OK**.

Changing a Storage System Password

To change a storage system password perform the following steps:

1. Click **Options** on the **Session** pane.
2. Click the Storage System Access **Set** button on the **Management Agent Options** page.
3. Click **Change** on the **Storage System Access Management Options** page.

   The **Change a Storage System Password** page displays (see Figure 2–9).

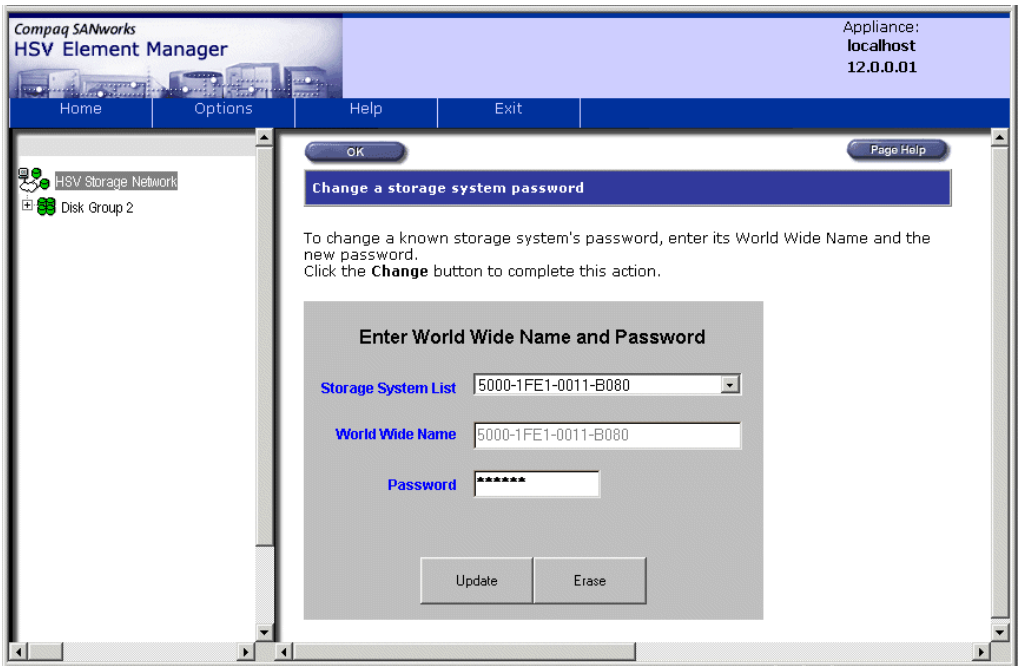


Figure 2–9: Change Storage System Password page

4. Complete one of the following two options:
   - Select the storage system to be changed from the drop-down menu available from the **Storage System List** field.
   - Enter the World Wide Name of the storage system you wish to change.

5. Enter the new password previously entered into the OCP of one of the storage system controllers.

A **Confirm Action** pop-up displays.

6. Click **OK**.

A status page displays.

7. Click **OK** to return to the **Storage System Access Management Options** page.

Deleting a Storage System Password

To delete a storage system password protection perform the following steps:

1. Click **Options** on the **Session** pane.
2. Click the Storage System Access **Set** button on the **Management Agent Options** page.
3. On the **Change a Storage System Password** page, click **Delete**.

   The **Delete Storage System(s)** page displays (see Figure 2–10).

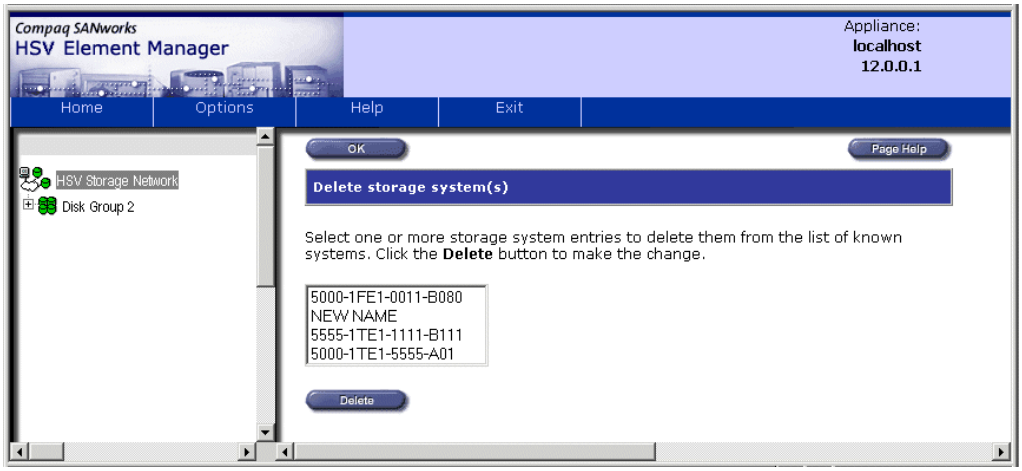


Figure 2–10: Delete Storage System(s) page

4. Select a storage system from those listed.

   NOTE: Holding the **Shift key** down while selecting storage systems allows you to select more than one storage system for deletion.

5. Click **Delete.**

A **Confirm Action** pop-up displays.

6. Click **OK**.

   A status page displays.

7. Click **OK** to return to the **Storage System Access Management Options** page.

Licensing

Virtual Controller Software products require licensing. You can obtain required license keys by following instructions in the *StorageWorks by Compaq Enterprise Virtual Array License Instructions*.

License Keys

There are two types of license keys: Basic and Snapshot.

NOTE: The Snapshot license key also includes the Snapclone feature.

Table 2–5 provides descriptions of these two types of keys.

Table 2–5: License Key Type Description

License Key Type	Description
Basic	Required to unlock the controllers' operating software. • It covers both controllers in the storage system. • It is required for system initialization.
Snapshot	Needed to unlock the Snapshot and Snapclone features, if these features are purchased. This license can be added any time before or after the system is initialized.

Accessing and Viewing Licensing Options

Selecting **Licensing Options** from the **Management Agent Options** page displays the **Licensing Options** page (see Figure 2–11). Management agent licensing options include viewing the existing license keys and adding license keys.

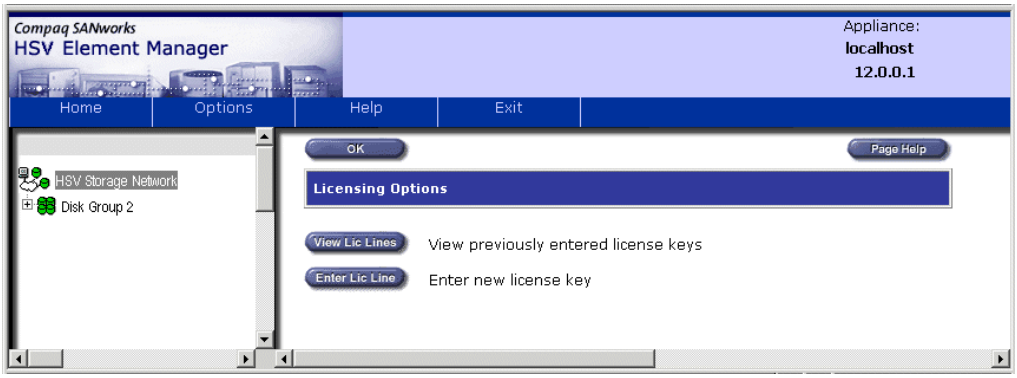


Figure 2–11: Licensing Options page

Table 2–6 provides descriptions of the two licensing options.

Table 2–6: Licensing Options

Option	Description
View previously entered license keys	Allows you to view previously entered license keys.
Enter new license key	Allows you to enter new license keys.

Viewing License Keys

You may view all license keys known to the current management agent. This may include license keys entered through other management agents that previously managed the same storage systems.

To view existing license keys:

1. Click **Options** on the **Session** pane.
2. Click **Set Licensing Options** on the **Management Agent Options** page.
3. Click **View Lic Lines** on the **Licensing Options** page.

The **View Licenses** page displays (see Figure 2–12).

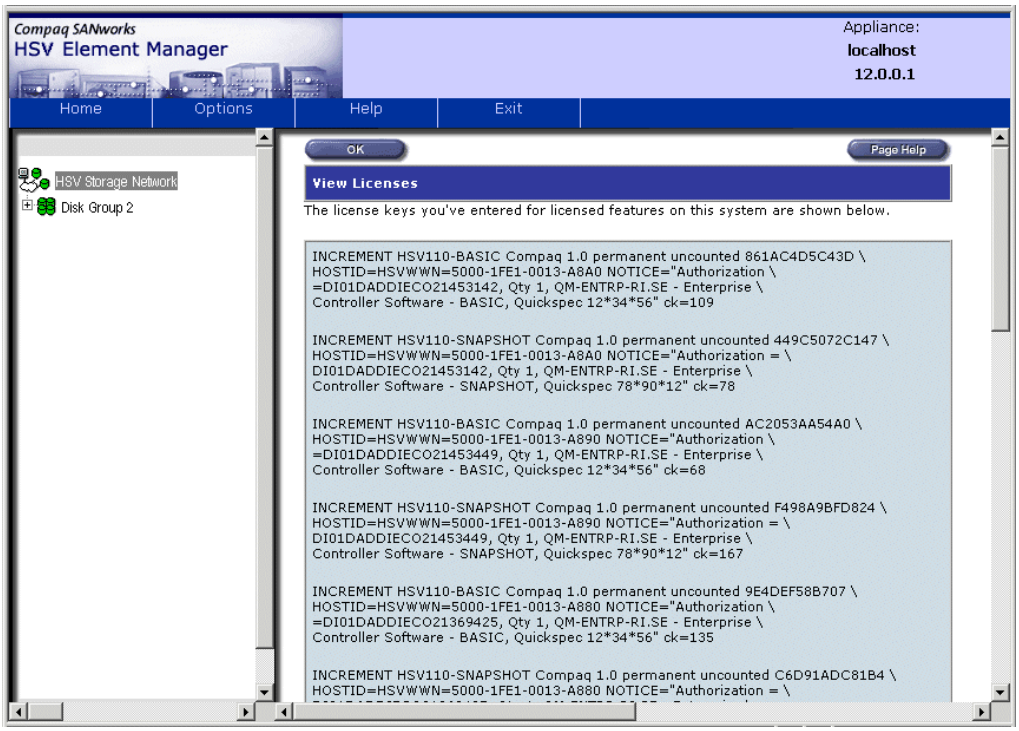


Figure 2–12: View Licenses page

4. Click **OK** to return to the **Licensing Options** page.

Entering or Adding a License Key

To operate the HSV controller you must enter a Basic License Key. You may also additional value-added License Keys, as needed.

NOTE: You can enter license keys for all the storage systems that this management agent will control at the same time, although you can obtain only ten license keys from the website at one time.

To enter a license key:

1. Click **Options** on the **Session** pane.
2. Click **Set** Licensing Options on the **Management Agent Options** page.

IMPORTANT: To avoid text entry errors, you may want to copy and paste license keys from an e-mail or on-line source. Avoid manual entry if possible or ensure it is absolutely correct. License keys require an ASCII text editor to ensure their correct format.

3. From the **Licensing Options** page, click **Enter Lic Line**.

   The **Add a License** page displays (see Figure 2–13).

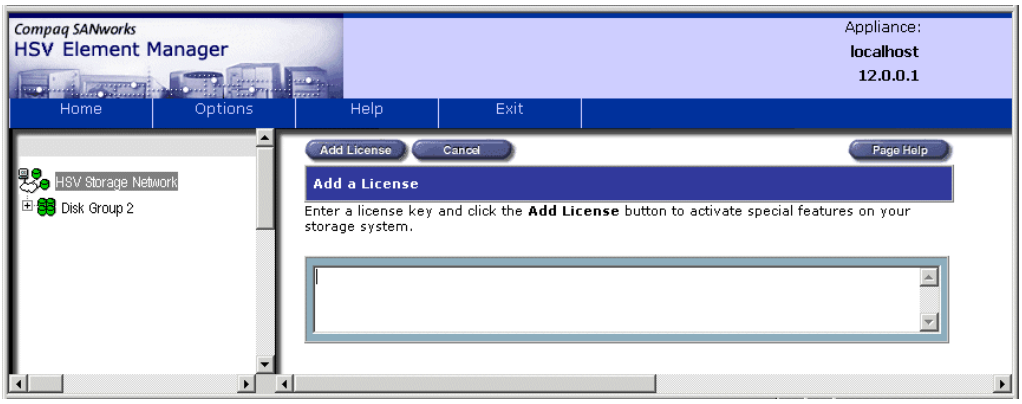


Figure 2–13: Add a License page

4. Copy the License Key from your email or on-line source.
5. Paste the license key in the dialog box.
6. Click **Add License** to save the information.

Setting User Interface Options

User Interface Options allow you to set user interface display characteristics.

To set user interface options:

1. Navigate to the **Management Agent Options** page by clicking **Options** on the **Session** pane (see Figure 2–6).
2. Click **Set** User Interface Options to display the **User Interface Options** page (see Figure 2–14), which allows you to specify browser display options.

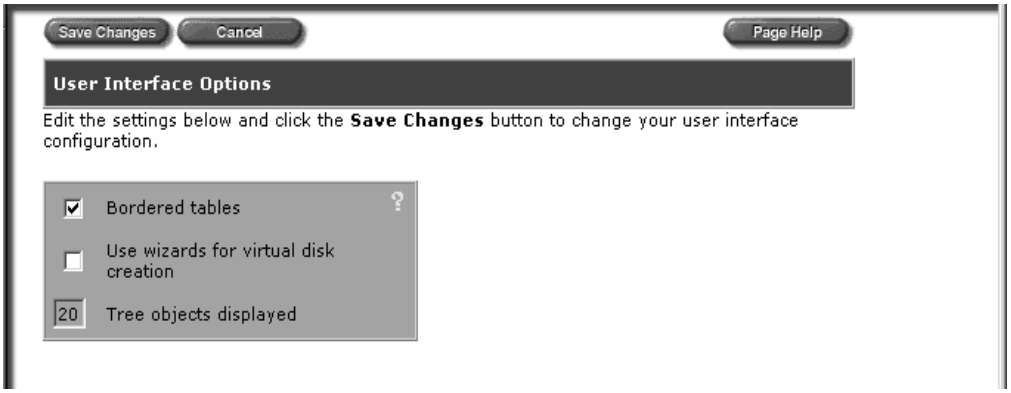


Figure 2–14: User Interface Options page

3. Select or enter desired settings.

Table 2–7 provides a description of each user interface option.

Table 2–7: User Interface Options Page Descriptions

Option	Description
Bordered tables	Controls whether the tables are displayed with borders.
Use wizards for virtual disk creation	Directs the system to present virtual disk creation tasks on a series of step-by-step-oriented pages (if selected). Directs the system to present virtual disk creation tasks on one page (if not selected).
Default operating system for new hosts	Allows you to select a default operating system for your host from those listed in the drop-down box. The selected host mode is set as the default host mode while adding a new host.
Tree Objects Displayed	Determines the maximum number of objects that can be displayed in the Navigation pane. Only numeric characters are valid for this field.

Setting Page Footer Message Options

Page Footer Message Options provide informational text at the bottom of the **Content** pane. The text entered will appear in red.

To set a page footer message:

1. Navigate to the **Management Agent Options** page by clicking **Options** on the **Session** pane (see Figure 2–6).
2. Click **Set Page Footer Message Options**.

   The **Set User Interface Security Message** page displays (see Figure 2–15).

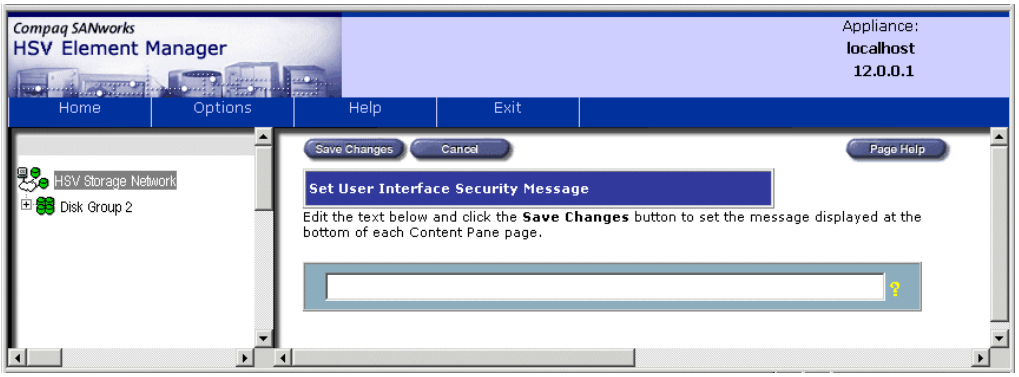


Figure 2–15: Set User Interface Security Message page

3. Enter text or edit the existing security message in the text box.
4. Click **Save Changes.**

   The new message displays in red text at the bottom of the **Content** pane.

Setting Display Refresh Options

To establish refresh polling intervals, set **Display Refresh Options**.

To set the Display Refresh options:

1. Navigate to the **Management Agent Options** page by clicking **Options** on the **Session** pane (see Figure 2–6).
2. Click **Set** Display Refresh Options.
   The **Display Refresh Options** page displays (see Figure 2–16).

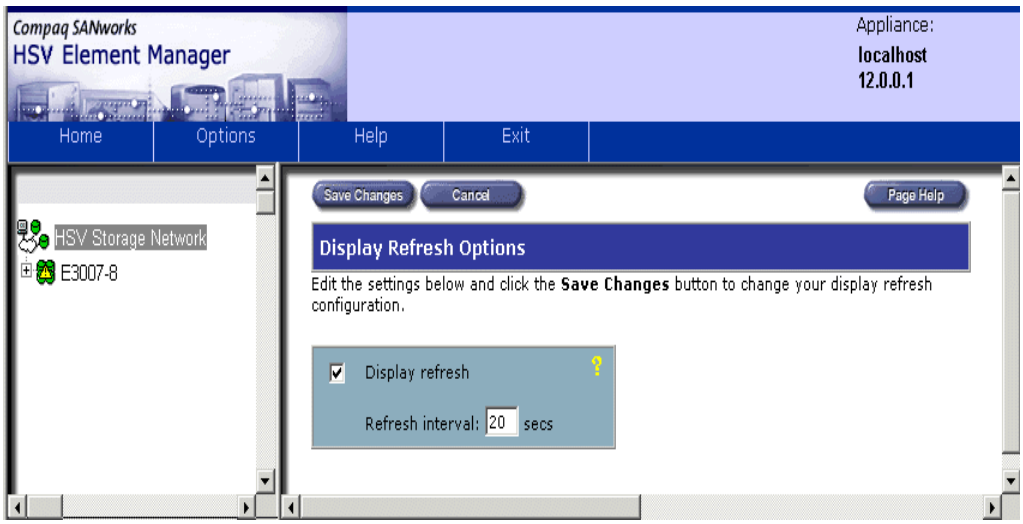


Figure 2–16: Display Refresh Options page

Table 2–8 provides Display Refresh Option descriptions.

Table 2–8: Display Refresh Option Descriptions

Option	Description
Display Refresh	Turns the automatic page refresh on or off.
Refresh Interval	Sets the amount of time in seconds between polls to the management agent for status.

To turn on the Display Refresh option:

1. From the **Display Refresh Options** page, click the **Display Refresh** checkbox.
2. Enter the interval period (in seconds) between polls in the **Refresh Interval** field.

To turn off the Display Refresh option, click the checked Display Refresh options box to remove the check mark.

Initializing the Storage System

Initialization makes the storage system ready for use, binds the controllers together as an operational pair, and establishes preliminary data structures on the disk array. It also sets up the first disk group (the default disk group).

To initialize a storage system:

1. Click the uninitialized storage system's icon in the **Navigation** pane. The **Uninitialized HSV Storage System Properties** page displays (see Figure 2–17).

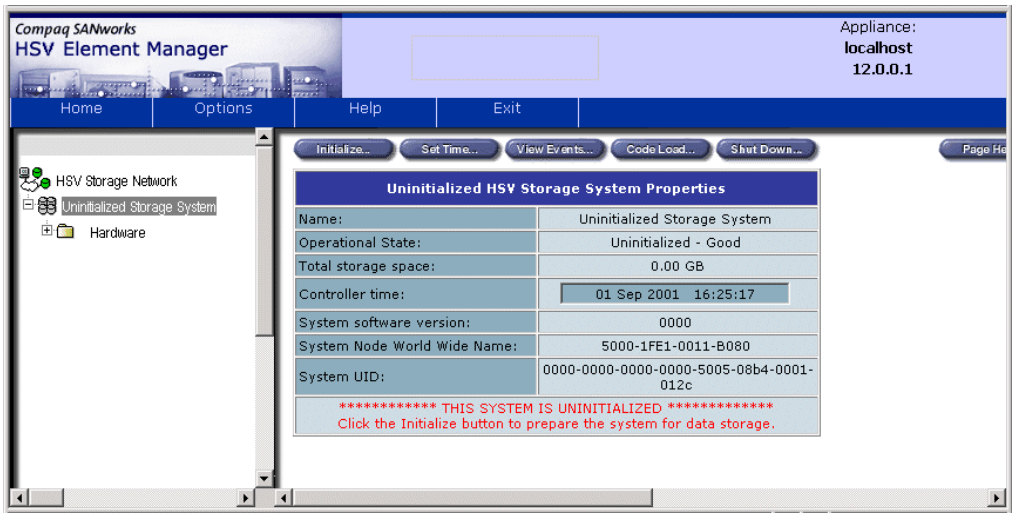


Figure 2–17: Uninitialized HSV Storage System Properties page

NOTE: See Chapter 4 for functionality of buttons on the **Uninitialized HSV Storage System Properties** page.

2. Click **Initialize**.

   A confirmation pop-up displays indicating that if you initialize the system, any existing data on the disk drives you use will be lost.

   NOTE: If you have not previously entered the basic license key for the storage system, you will be prompted to do so. Otherwise, a series of screens guide you through choosing initialization options.

3. Click **OK**.

Steps 1 and 2 of the **Initialize a Storage System** page display (see Figure 2–18).

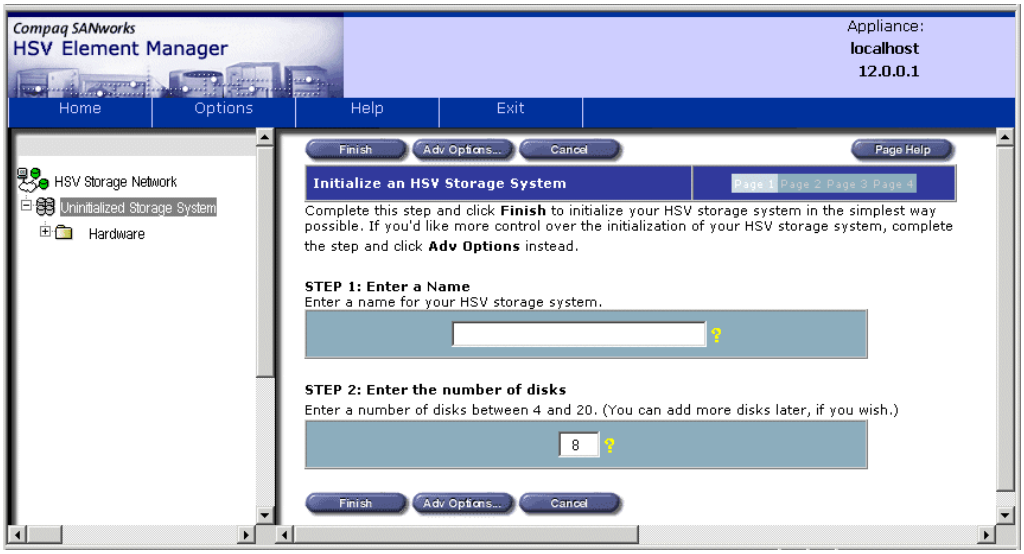


Figure 2–18: Initialize an HSV Storage System page

4. Enter a name for the HSV storage system.
5. Specify the number of disks in the default disk group.
6. Click **Finish.**

To specify advanced options for the system, click **Adv Options.** Advanced Options are discussed in the following section, "Using Storage System Initialization Advanced Options."

Using Storage System Initialization Advanced Options

The following advanced options are available for controlling the storage system attributes and behavior:

- Set system date/time
- Set console LUN ID
- Set disk failure protection level
- Enter comments

To use the additional options, complete the following steps and click **Finish** on any page when you are finished configuring your system:

1. From the **Initialize an HSV Storage System** page, click **Adv Options**.

   Page 2 (Steps 3 and 4) of the **Initialize an HSV Storage System** page displays (see Figure 2–19).

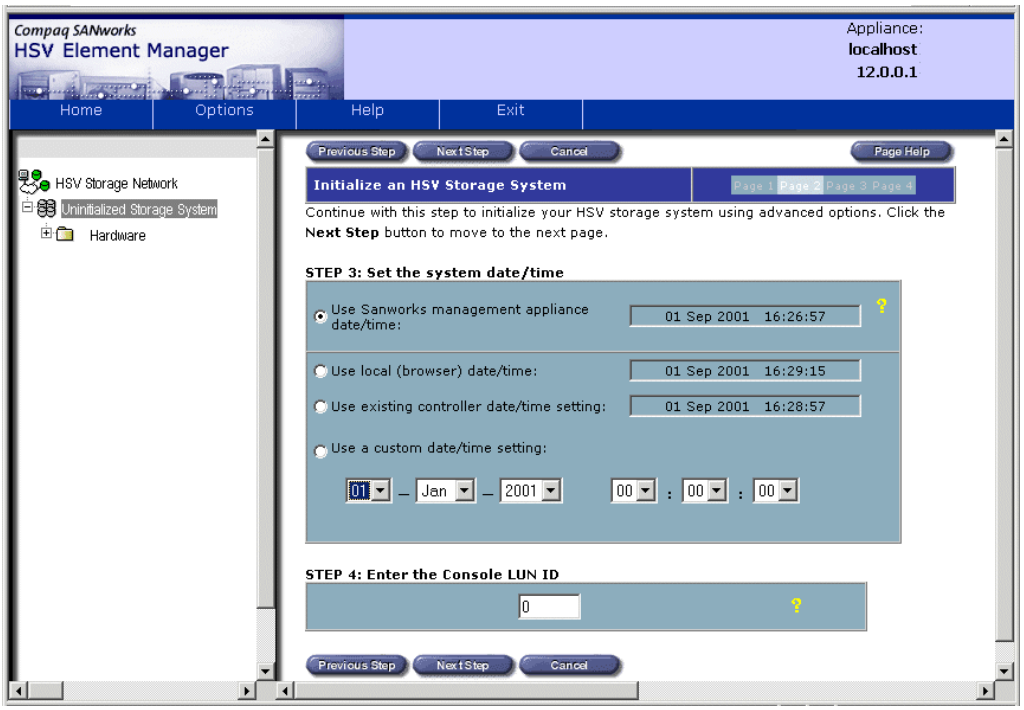


Figure 2–19: Page 2 of the Initialize an HSV Storage System page

2. Choose one of the four options available for setting storage system time and date.

   Table 2–9 provides date and time option descriptions.

Table 2–9: Page 2 Initialize an HSV Storage System Descriptions

Options	Description
Use Management Appliance system date/time	Sets the storage system date and time to the settings on the Management Appliance.
Use local browser date/time	Sets the storage system date and time to the settings on the local browser.
Use existing controller date/time settings	Sets the storage system date and time to the settings on the existing controller pair's real-time clock.
Use custom date/time setting	Sets the storage system date and time to the time you enter in the boxes. A custom time is useful for measuring elapsed time. For example, you can set the time to all zeroes at some starting point in order to time an event relative to the starting point.

3. Select a date and time option.
4. Enter a console LUN ID appropriate to your operating system.
5. Click **Next Step**. **Page 3** (Step 5) of the **Initialize an HSV Storage System** page displays (see Figure 2–20).

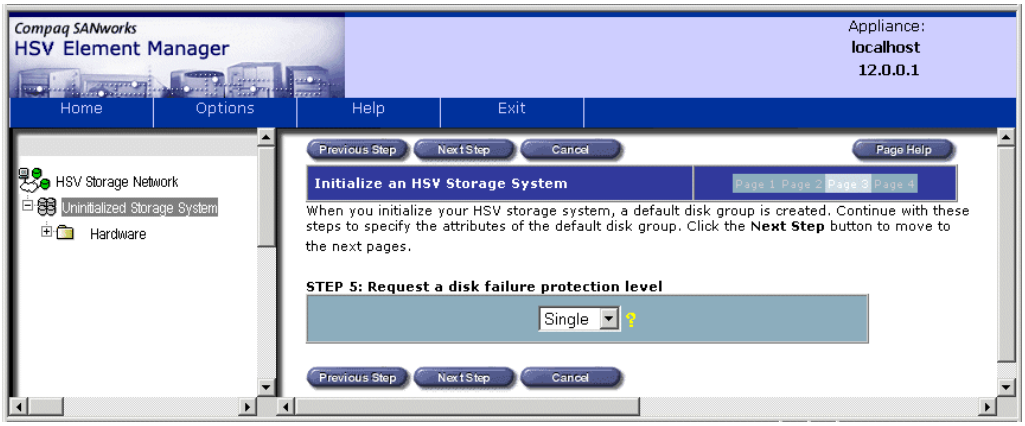


Figure 2–20: Page 3 of the Initialize an HSV Storage System page

6. Select the disk protection level from the drop-down menu.

7. Click **Next Step** to continue to **Page 4** (Steps 6 and 7) of the **Initialize an HSV Storage System** page (see Figure 2–21).

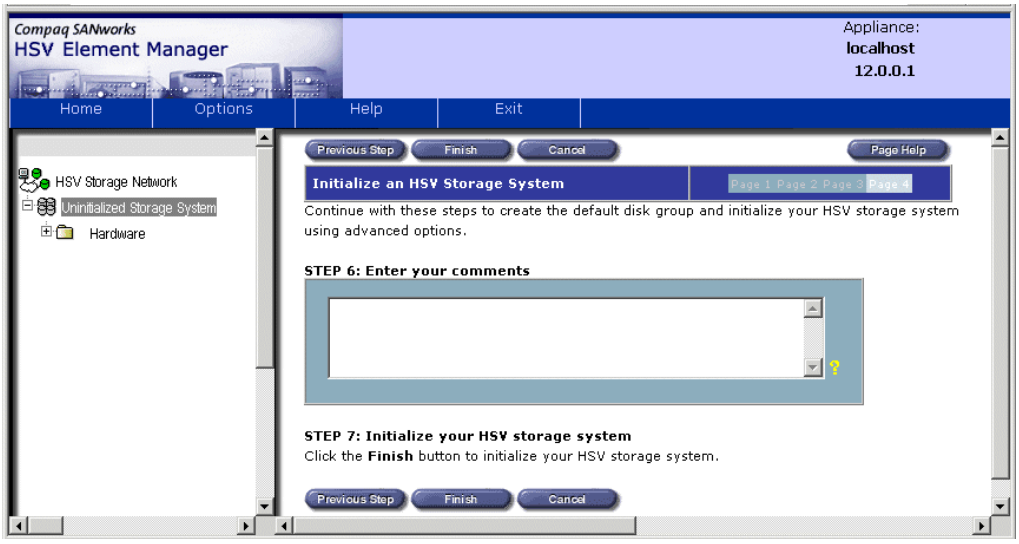


Figure 2–21: Page 4 of the Initialize an HSV Storage System page

8. If desired, enter informational text regarding the initialization.

   NOTE: This field can contain up to 128 characters.

9. Click **Finish** to begin initialization.

   A pop-up window displays verifying selected size and protection level

After completing initialization, a status screen displays and indicates whether the initialization was successful.

3

Configuring and Managing the Storage System

When the HSV Element Manager is set up and the storage system is initialized, you can configure and manage the storage system. This chapter provides general information and instructions for configuring and managing the storage system including the following tasks:

- Working with Disk Groups
- Working with Virtual Disks
- Working with Snapshots
- Working with Virtual Disks
- Working with Snapclones
- Working with Hosts
- Working with Ports

This chapter provides general information and instructions for managing the above functions.

NOTE: Many of the instructions detailed in this chapter are provided with the wizard option enabled. Pages depicted in each referenced figure may differ if the wizard option is not enabled. The wizard option is available through the **User Interface Options** of the **Management Agent Options** page, accessible via the **Options** button in the **Session** pane.

Working with Disk Groups

A disk group is the set or pool of physical disk drives on which one or more virtual disks are created. The following applies to a disk group:

- Each physical disk drive can belong to only one disk group.
- Multiple virtual disks can be created in one disk group, up to the disk group's capacity.
- Each virtual disk exists entirely within one disk group.

A disk group may contain all the physical disk drives in a controller pair's array or it may contain a subset of the array. The minimum number of disks in a disk group is eight.

One disk group (the default) is created when the system is initialized. You may add disk groups as needed.

All the virtual disks in a disk group are created across all the physical disks of the disk group. A physical disk is a disk drive that plugs into an enclosure slot and communicates to the controllers through the device-side Fibre Channel loops.

NOTE: Only the controllers can communicate directly with the physical disks. One controller pair can support 240 physical disks.

The **Disk Group Folder Properties** page (see Figure 3–1) provides a summary of the folder's contents.

To display the **Disk Group Folder Properties** page, select **Disk Groups** in the HSV Element Manager **Navigation** pane.

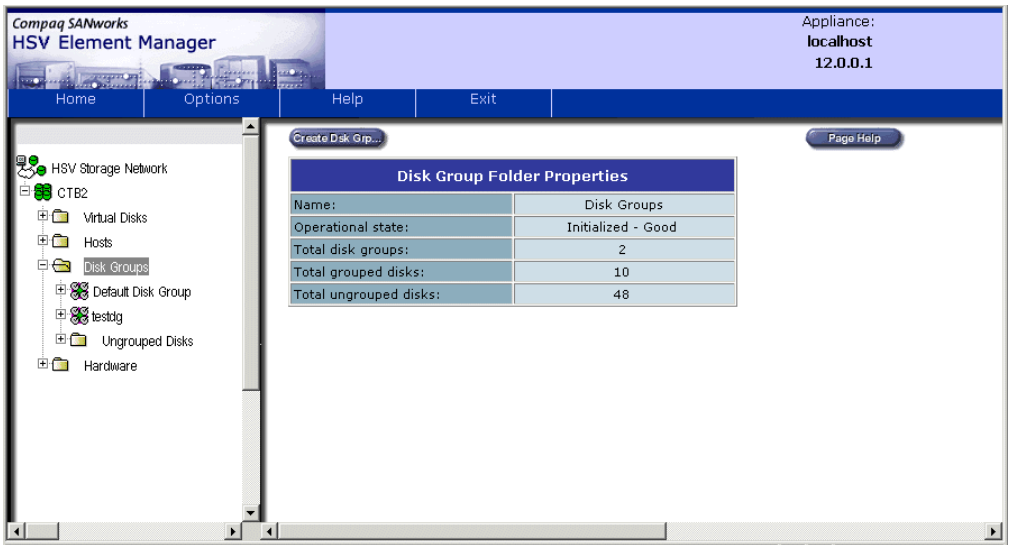


Figure 3–1: Disk Group Folder Properties page

Table 3–1 summarizes the fields on the **Disk Group Folder Properties** page.

Table 3–1: Disk Group Folder Property Descriptions

Property	Description
Name	Contains the unique name assigned to the disk group folder.

Table 3–1: Disk Group Folder Property Descriptions (Continued)

Property	Description
Operational State	Displays whether the folder is functioning properly or needs attention. There are three possible states: • Good • Attention • Failed
Total Number of Disk Groups	Identifies the number of disk groups within the folder.
Total Grouped Disks	Contains the total number of physical disks assigned to disk groups.
Total Ungrouped Disks	Contains the total number of disks that are not assigned to disk groups. The ungrouped disks pages are in a folder under the Disk Group Folder.

When navigating to any one of the disk groups within the **Disk Groups** folder, the **Disk Group Properties** page displays (see Figure 3–2). Each disk group listed in the **Navigation** pane has its unique properties page. The page provides information about how each of the disk groups is configured.

To display the **Disk Group Properties** page, expand a **Disk Group** folder and click on a Disk Group.

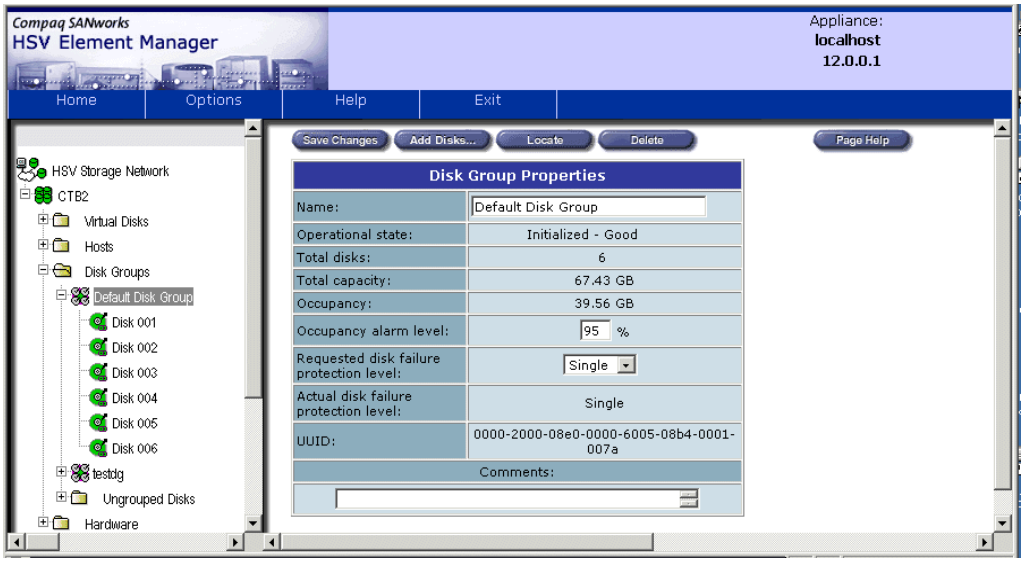


Figure 3–2: Disk Group Properties page

Table 3–2 provides a summary of each of the fields listed on the **Disk Group Properties** page.

Table 3–2: Disk Group Properties Page Description

Field Name	Description
Name	Contains the unique name assigned to a disk group. The maximum length of a disk group name is 32 characters. Names can contain any characters **except** for the following: • ? (question mark) • “ (double quotes) • / (slash) • \ (backslash) • < (less than sign) • > (greater than sign) • * (asterisk) • | (vertical bar) • : (colon) • % (per cent) • & (and) • , (comma) • + (plus) The disk group name should be a meaningful name that can be easily remembered. For example: A disk group for an accounting department could be called DG Accounting 1.
Operational state	Displays whether the disk group is initialized and if it is functioning properly or needs attention. There are three possible states: • Good • Attention • Failed
Total disks	Contains the number of physical disks in the disk group.

Table 3–2: Disk Group Properties Page Description (Continued)

Field Name	Description
Total capacity	Contains the total capacity of the disk group in gigabytes (GB).
Occupancy	Contains the total capacity of the disk group that is currently in use by virtual disks
Occupancy alarm level	Indicates the level of data stored in the disk group that generates an event code. For example, if a disk group's capacity is 576 GB and the occupancy alarm level is 80%, the event code will be generated when the amount of data in the disk group reaches 460 GB. The default occupancy alarm level is 95%.
Requested disk failure protection level	Specifies the failure protection level. The failure protection level is the reserved capacity that the controller pair sets aside to take over the functionality of a failed or failing physical disk drive. Three levels of disk failure protection are: • None • Single—the capacity of one physical disk is reserved. • Double—the capacity of two physical disks is reserved. The reserved capacity is based on the largest disk in the disk group. The system has to cover a failure in any drive, so it reserves enough to cover the largest failure that could happen.
Actual disk failure protection level	Displays the actual level of protection available to the disk group as it is currently constructed (May differ from Requested disk failure protection level because of space deficiency).

Table 3–2: Disk Group Properties Page Description (Continued)

Field Name	Description
UUID (Unique Universal Identifier)	Both the controller software and the element manager software are object-oriented. Each object in a storage system, whether a hardware element or a software structure, has a unique universal identifier, or UUID. The various objects on a storage system use the UUID to identify each other. This software construct is not normally visible to the user. However, the element manager software does display the UUID for some objects—for example, virtual disks and in the event log.
Comments	Comment fields are spread throughout the GUI. Each comment field can contain up to 128 characters. Ways that you can use comments include the following: • Hardware locations • Past failure information • Departmental ownership

The following subsections provide procedures on how to complete disk group management tasks.

- Creating Disk Groups
- Adding Disks to a Disk Group
- Modifying a Disk Group
- Deleting a Disk Group

Creating Disk Groups

To create a disk group:

NOTE: See Table 3–2 for property descriptions when entering information or selecting options for each page.

1. From the **Disk Group Folder Properties** page, click **Create Disk Grp**.

The **Create a Disk Group** page displays (see Figure 3–3).

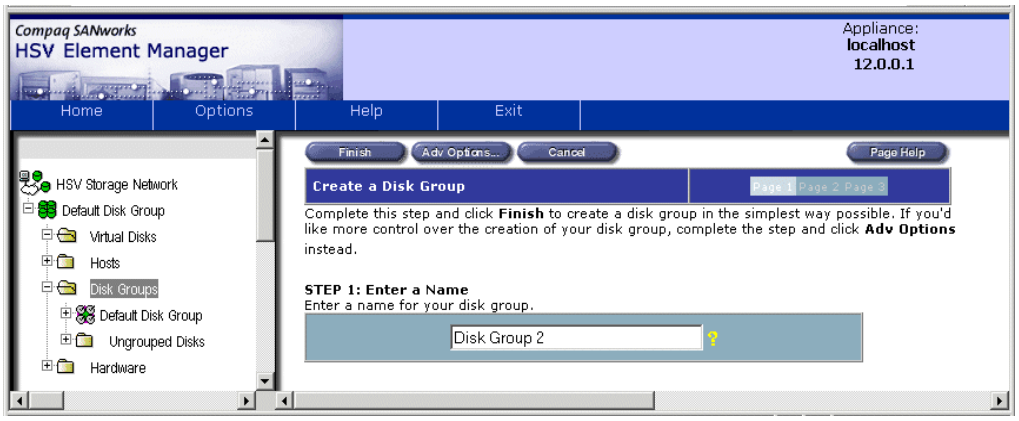


Figure 3–3: Create a Disk Group page

2. Enter a name for the disk group in the **Enter a Name** field in STEP 1.
3. Click **Finish** to complete your request or click **Adv Options** to set other disk group properties. Default size of disk group will be 8 disks.

Using the Create a Disk Group Advanced Options

1. From **Page 1** of the **Create a Disk Group** page, click **Adv Options**.

   Page 2 of the **Create a Disk Group** page displays (see Figure 3–4).

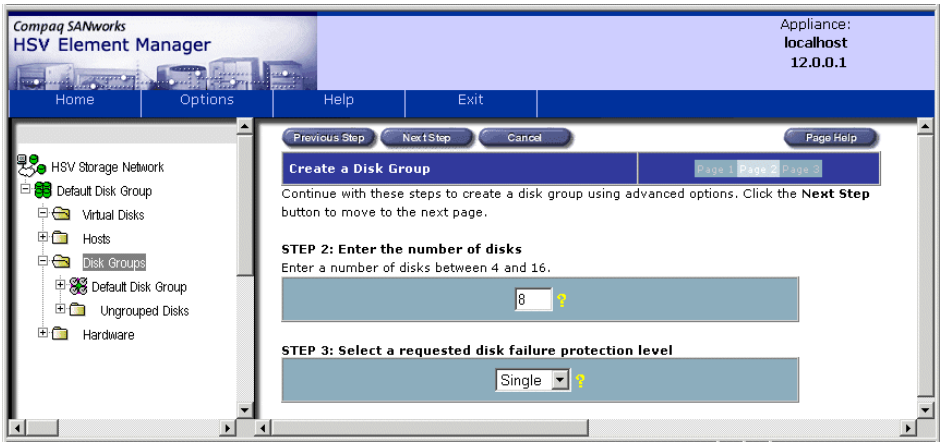


Figure 3–4: Page 2 of the Create a Disk Group page

2. Enter the number of disks to be used in your disk group.
3. Choose the protection levels from the drop-down menu in STEP 3.
4. Click **Next Step**.

   Page 3 of the **Create a Disk Group** page displays (see Figure 3–5).

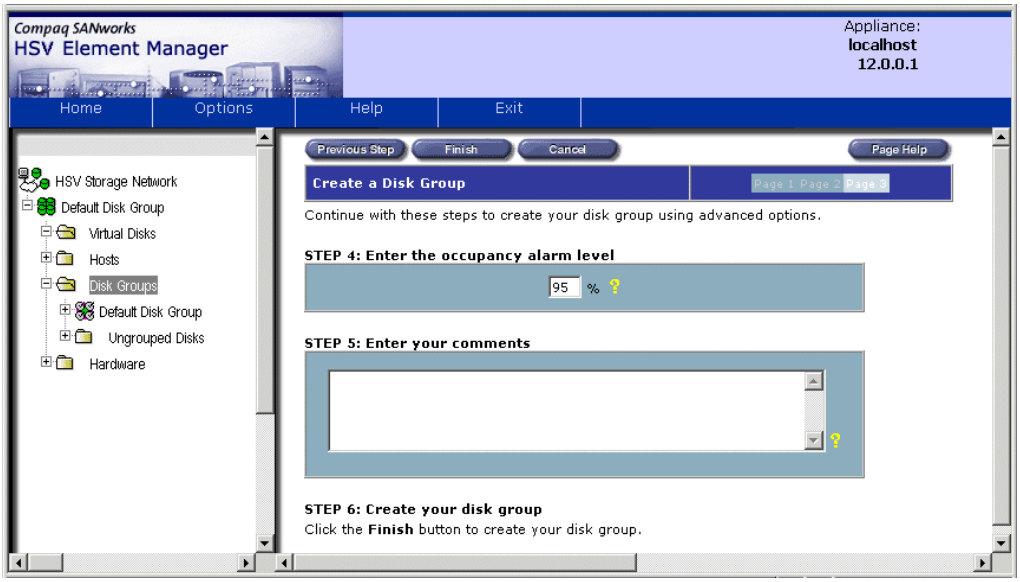


Figure 3–5: Page 3 of the Create a Disk Group page

5. Indicate the occupancy alarm level (as a percentage) which indicates when you would like the system to inform you when the disk group reaches peak capacity.
6. Enter comments as needed in the **Enter your comments** field.
7. Click **Finish**.

   A pop-up displays stating that all data (if any exists) on the disks will be lost.
8. Click **OK** to proceed.

   A status page displays.
9. Click **OK**.

   The updated **Disk Group Properties** page displays.

Adding Disks to a Disk Group

The following instructions explain how to add disks to disk groups.

To add disks to a disk group:

1. Expand a **Disk Groups** folder in the **Navigation** pane and click on a **Disk Group**.

   The **Disk Group Properties** page displays.

2. Click **Add Disks**.

   The **Add Disks to Disk Group** page displays (see Figure 3–6).

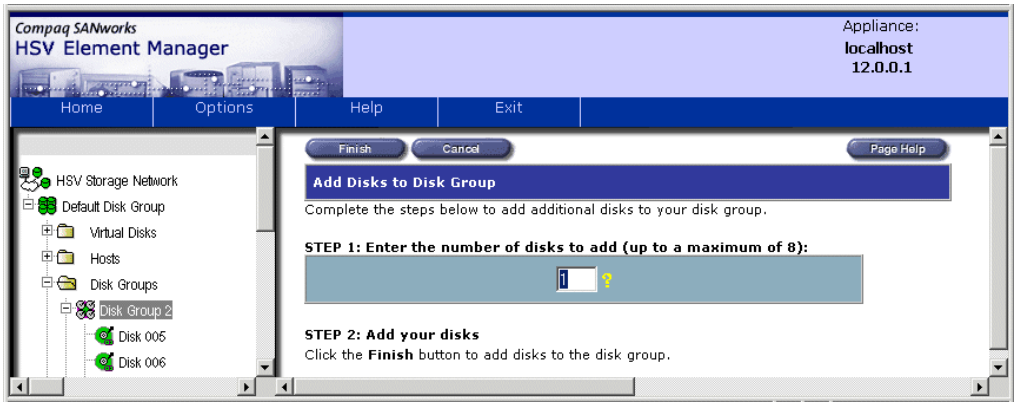


Figure 3–6: Add Disks to Disk Group page

3. Enter the number of disks to be added in STEP 1.

   The maximum number of disks that can be added is the total remaining ungrouped disks.

4. Click **Finish**.

   A status page displays.

5. Click **OK**.

   An updated **Disk Group Properties** page displays.

Modifying a Disk Group

This section provides information on how to modify an existing disk group. You can modify the following disk group properties:

- Name

- Occupancy alarm level
- Disk failure protection level
- Comments

To modify disk group properties:

1. Navigate to the **Disk Group Properties** page (see Figure 3–2) of the disk group to be modified.
2. Make modifications.
3. Click **Save Changes**.

   A status page displays.
4. Click **OK**.

   An updated **Disk Group Properties** page displays.

Deleting a Disk Group

Before deleting a disk group, all virtual disks that the disk group contains must be deleted (see "Working with Virtual Disks").

To delete the disk group:

1. Select the disk group to be deleted in the **Navigation** pane.

   The **Disk Group Properties** page displays.
2. Click **Delete** in the **Content** pane.

   A **confirmation pop-up** displays indicating that all data for the selected disk group will be lost.
3. Click **OK** on the confirmation pop-up (or click **Cancel** to stop the process).

   A status page indicating whether the deletion was successful displays.
4. Click **OK**.

Working with Virtual Disks

A virtual disk is a simulated disk drive created by the controllers as storage for one or more hosts. The virtual disk's characteristics provide a specific combination of capacity, availability, performance, and accessibility. The controller pair simulates these characteristics as a segment of the disk group specified for the virtual disk. The

host computer sees the virtual disk as “real,” exactly as it would see a physical disk with the same characteristics. The maximum number of virtual disks is 2,048, of which 1,024 can be presented at one time. The maximum size of a virtual disk is 2 terabytes (TB).

NOTE: You can create virtual disks up to 2 terabytes in size. However, the system cannot contain more than 32 terabytes of presented virtual disks.

There are three types of virtual disks:

- Active Member of Virtual Disk Family – An Active member of a virtual disk family is a normal virtual disk, one that is accessed by one or more hosts for storage. It is automatically created whenever a new virtual disk family is created.
- Virtual Disk Snapshot – A temporary virtual disk that reflects the contents of the Active member of a virtual disk family at a certain point in time.
- Virtual Disk Snapclone – A virtual disk family that is an exact copy of another virtual disk family at a particular point in time.

Working with Active Members of a Virtual Disk Family

Working with Active members of a virtual disk family allows you to do the following:

- Modify Active members of a virtual disk family
- Present (or unpresent) the disk group to a host
- Deleting a virtual disk family
- Create a snapshot
- Modify a snapshot
- Delete a snapshot
- Create a Snapclone

To display the **Virtual Disk Folder Properties** page, click a **Virtual Disk** folder in the **Navigation** pane. The **Virtual Disk Folder Properties** page (see Figure 3–7) provides general information regarding the virtual disks in the folder.

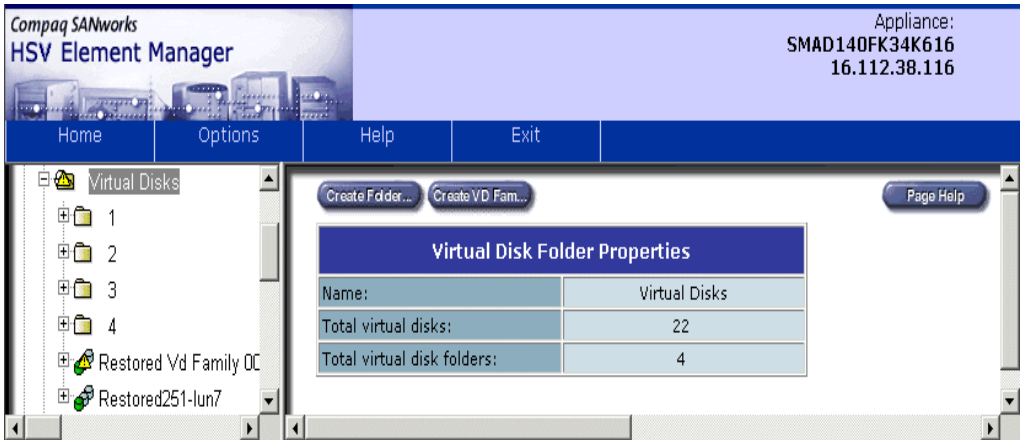


Figure 3–7: Virtual Disk Folder Properties page

Table 3–3 provides descriptions of the properties on the **Virtual Disk Folder Properties** page.

Table 3–3: Virtual Disk Folder Properties Page Descriptions

Property	Description
Name	Unique name given to a virtual disk family folder or subfolder.
Total Virtual Disks	Number of virtual disks that are in this folder excluding its subfolder.
Total Virtual Disk Folders	Total number of subfolders in this folder.

The **Virtual Disk** folder in the **Navigation** pane contains virtual disk families. Each virtual disk family has a **Virtual Disk Family Properties** page. Click on the **Virtual Disk Family** icon to display the properties page for that virtual disk family (see Figure 3–8).

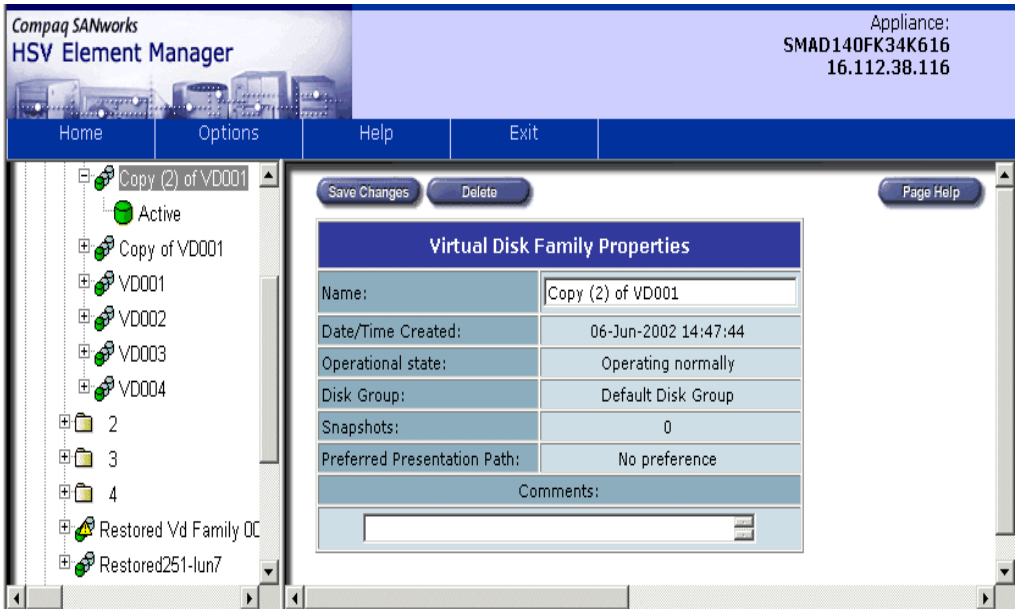


Figure 3–8: Virtual Disk Family Properties page

Table 3–4 provides descriptions for items on the **Virtual Disk Family Properties** page.

Table 3–4: Virtual Disk Family Property Descriptions

Property	Description
Name	Unique name assigned to a virtual disk (or, to a virtual disk family). The maximum length for the name is 32 characters. Names can contain any characters **except** for the following: • ? (question mark) • " (double quotes) • / (slash) • \ (backslash) • < (less than sign) • > (greater than sign) • * (asterisk) • | (vertical bar) • : (colon) • % (per cent) • & (and) • , (comma) • + (plus) When establishing the name, use a meaningful name that can be easily remembered. For example, a disk that contains payroll data could be called Payroll or Payroll January.
Date/Time Created	When a virtual disk family was created.
Operational state	Indication of whether the virtual disk is operating normally, is failed, or needs attention.
Disk Group	Disk group with which the virtual disk family is associated.
Snapshots	Number of snapshots associated with the selected virtual disk family. The Active disk and its snapshot constitute part of a virtual disk family. A created snapshot is intended to be a temporary entity.

Table 3–4: Virtual Disk Family Property Descriptions (Continued)

Property	Description
Preferred Presentation Path	Indicates which controller (A or B) is the preferred path of virtual disk presentation at restart. The choices are as follows: • No preference – Presentation of the virtual disk alternates between two controllers. • Prefer A – Controller A will present the virtual disk to hosts. • Prefer B – Controller B will present the virtual disk to hosts. • Prefer A, Failback Enabled – Controller A will present the virtual disk until failover in which case B will present. When controller A is recovered, then control is switched to A. • Prefer B, Failback Enabled—Controller B will present the virtual disk until failover in which case A will present. When controller B is recovered, then control is switched to B.
Comments	Fields provided throughout the GUI for comments. Each comment field can contain up to 128 characters. Ways that you can use comments include the following: • Hardware locations • Past failure information • Departmental ownership

The following subsections explain how to complete the virtual disk management tasks.

- Creating a Virtual Disk Family
- Modifying a Virtual Disk
- Deleting a Virtual Disk Family

Creating a Virtual Disk Family

A virtual disk family is created from the **Virtual Disk Folder Properties** page. To create a virtual disk family:

1. From the **Virtual Disk Folder Properties** page (see Figure 3–7), click **Create VD Fam**.

   The **Create a Virtual Disk Family** page displays (see Figure 3–9).

2. Enter a name for the virtual disk in the **Virtual Disk Name** field.

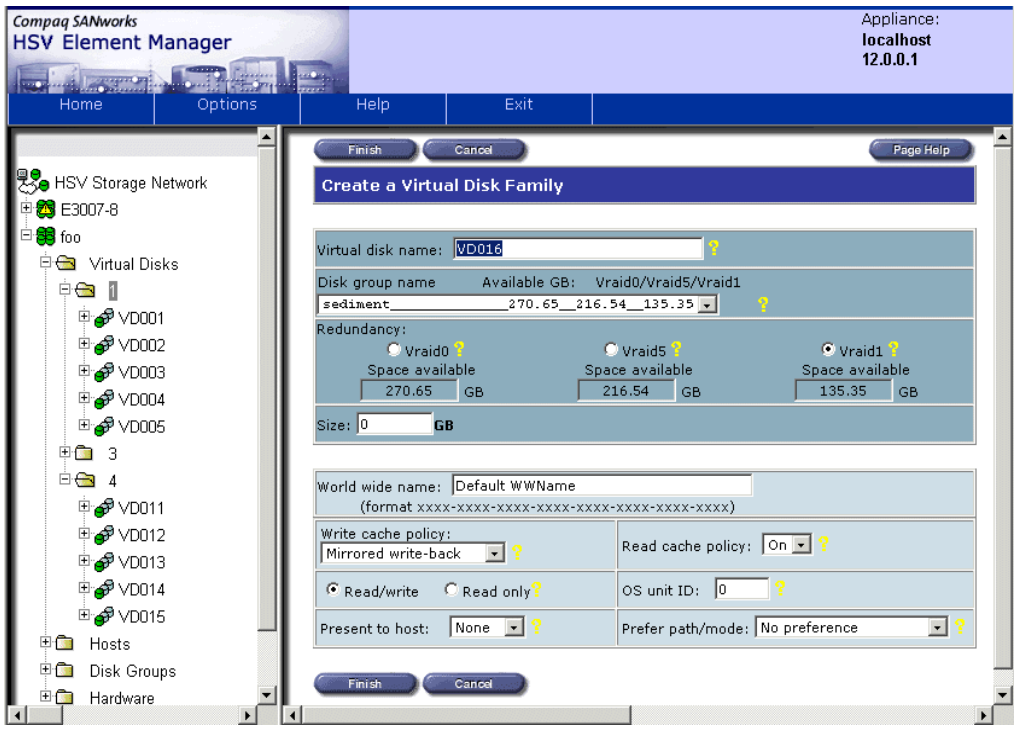


Figure 3–9: Create a Virtual Disk Family page

3. Select the disk group to be associated with the virtual disk family from the drop-down menu in the **Disk group name** field.
4. Choose the redundancy level for the disk group family. The choices are Vraid0, Vraid5, and Vraid1.

5. In the **Size** field, indicate in gigabytes the capacity of the virtual disk you wish to create.

   NOTE: The maximum size of a virtual disk depends upon the unused capacity of the disk group in which it is created and the selected redundancy (data protection) level.

6. Select a policy from the **Select a write-cache policy** drop-down menu.

This policy is the write cache policy for the virtual disk family

7. Select a read cache policy from the **Read cache policy** drop-down menu.
8. Select **Read/write** or **Read only** protection for the virtual disk family.
9. Enter the **OS Unit ID**.
10. Indicate to which host the disk group is to be presented by selecting a host from the **Present to Host** drop-down menu.

    If you select a host, a confirmation pop-up displays. The pop-up confirms and indicates that underlying structures of the disk must be completely set up.

11. Select an option from the drop-down menu in the **Prefer path/mode** field.
12. Click **Finish**.

    A status page displays.

13. Click **OK** to return to the **Virtual Disk Family Properties** page or click **Create More VDs** to create another virtual disk.

    The virtual disk has to be completely created in order to be presented to a host.

For a large virtual disk—in the range of 100 GB or larger—creation can take 10 minutes to several hours. If you select a host for presentation as an option when you start the virtual disk creation process, the management agent remains unresponsive until the virtual disk has been completely created and presented. Therefore, create the virtual disk without presenting it, so that the management agent is free to perform other tasks. Then, when the virtual disk has been completely created, you can present it to a host.

Modifying a Virtual Disk

The following properties can be changed on the **Virtual Disk Active Properties** page:

- Write cache policy (if the virtual disk family has not been presented)
- Read cache policy
- Write protection

- OS Unit ID
- World Wide LUN ID
- Preference path/mode

To modify a virtual disk:

1. Expand a **Virtual Disk** folder in the **Navigation** pane.
2. Click on a **Virtual Disk Family**.
3. Click on the **Active Virtual Disk**.

The **Virtual Disk Active Properties** page displays.

4. Make necessary changes to the Virtual Disk Active properties.
5. Click **Save Changes**.

   A status page displays indicating whether the modification was completed successfully.
6. Click **OK**.

An updated **Virtual Disk Active Properties** page displays.

Deleting a Virtual Disk Family

If the virtual disk family contains a snapshot, you must delete the snapshot before deleting the virtual disk family.

To delete the snapshot:

1. In the **Navigation** pane, navigate to the snapshot to be deleted.
2. Click **Delete**.

   A confirmation pop-up displays.
3. Click **OK** to delete the snapshot.

To delete a virtual disk family:

1. Navigate to the virtual disk family to be deleted.
2. Click **Delete**.

   A confirmation pop-up displays.
3. Click **OK** to delete the virtual disk family.

The virtual disk family Active members are deleted.

Working with Snapshots

A snapshot is a point-in-time duplicate of a virtual disk family's Active member. There are two types of snapshots: a standard snapshot and a capacity-free snapshot. The standard snapshot requires that you reserve and set aside the capacity equal to that of the original Active members of a virtual disk family for the snapshot. Data is not written into this reserved space until necessary. As data changes in the original Active members of a virtual disk family, the original data is written to the snapshot.

The snapshot appears in the same virtual disk family as the Active member of a virtual disk family.

NOTE: Ensure no copy is in process when creating a snapshot of an Active member of a virtual disk family.

A snapshot is always formed in the same disk group as the original Active members of a virtual disk family. As the capacity of the disk group is consumed, the space available to write data is reduced. If no additional capacity is added and the disk group becomes full, standard snapshots may be deleted to regain capacity.

When you select a snapshot of an Active member of a virtual disk family from the **Navigation** pane, the **Virtual Disk Snapshot Properties** page displays (see Figure 3–10).

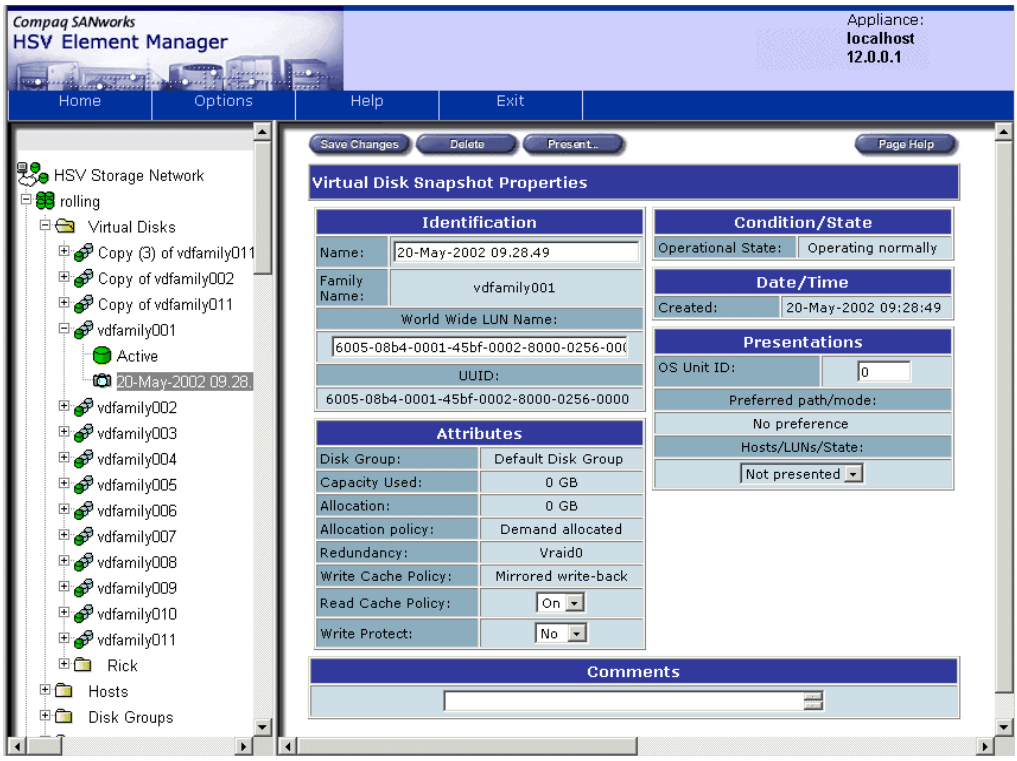


Figure 3–10: Virtual Disk Snapshot Properties page

Table 3–5 provides a description for each property on the **Virtual Disk Snapshot Properties** page.

Table 3–5: Virtual Disk Snapshot Properties Description

Property	Description
Name	Unique name given to the snapshot. Typically, the name is the date and time the snapshot was created. However, it can be a name that is up to 32 characters long. The name can contain any characters **except** for the following: • ? (question mark) • " (double quotes) • / (slash) • \ (backslash) • < (less than sign) • > (greater than sign) • * (asterisk) • | (vertical bar) • : (colon) • % (per cent) • & (and) • , (comma) • + (plus) • **NOTE:** You should use a meaningful name that can be easily remembered for the snapshot.
Family Name	The virtual disk name is assigned to a virtual disk or to a virtual disk family.
World Wide LUN Name	Unique, 128-bit value that the controller assigns when the virtual disk is initialized or reinitialized. The World Wide LUN Name applies only to virtual disks. **Note**: World Wide LUN Name is made up of the controller node (that is, "pair") WWN and another 64-bit value representing the specific virtual disk.

Table 3–5: Virtual Disk Snapshot Properties Description (Continued)

Property	Description
UUID	Identification for each object in a storage system. Both the controller software and the element manager software are object-oriented. Whether the object is a hardware element or a software structure, it has a unique universal identifier, or UUID. The various objects on a storage system use the UUID to identify each other. This software construct is not normally visible to the user. However, the element manager software does display the UUID for some objects—for example, virtual disks in event logs.
Disk Group	Name of the disk group in which the virtual disk snapshot is nested.
Capacity used	Number of gigabytes currently used by the virtual disk.
Allocation	Number of gigabytes allocated for the snapshot. The value displayed depends on the allocation policy.
Allocation policy	An allocation policy is an option that specifies the amount of reserved space for a virtual disk. Two choices exist: • Allocate completely—Reserves the amount of space in the disk group equal to the size of the Active member of the snapshot. • Allocate on demand—Reserves no space in advance. The snapshot assumes space as required. **Note**: There is no guarantee that enough space will be available in the disk group to completely fill the virtual disk.

Table 3–5: Virtual Disk Snapshot Properties Description (Continued)

Property	Description
Redundancy	Level of data protection, with three possibilities: • Vraid0 (striping) • Vraid5 (parity striping) • Vraid1 (mirroring)
Write Cache Policy	Indication of how the controller handles write operations. When a controller receives a write request from the host, it places the data in its cache memory. From cache memory, the controller transfers the data onto the physical disk drives.The host is notified that the write operation is complete when the data is written in the cache memory. Write-back caching improves response time since the write operation completes as soon as the data reaches cache. The controller performs the slower operation of writing the data to the disk drives as soon as possible after caching the data. Two types of write cache operation exist: • Mirrored write-back mode – Host write data is written to cache memory on both controllers for redundancy. • Unmirrored write-back mode – Host write data is written to cache memory on only one controller, which increases the effective size of the cache.

Table 3–5: Virtual Disk Snapshot Properties Description (Continued)

Property	Description
Write Cache Policy (continued)	The write-cache policy cannot be changed under the following circumstances: • For snapshots or snapclones • For Active virtual disks, if a snapclone is in progress, a snapshot exists, or the virtual disk is presented. **NOTE:** If a snapclone is in progress or a snapshot exists, the virtual disk size cannot be increased, but presentation does not affect expanding the virtual disk size. HSV controllers that are fully functional use only write-back cache. Under certain failure conditions, the controllers revert to write-through for data safety.
Read Cache Policy	Read cache policy assigned to the virtual disk. Data can be read from cache memory much faster than it can be read from a disk. Read caching increases performance by satisfying host read requests from the cache memory instead of from the physical disks. The read cache is specified as either on or off for each virtual disk. The default state is on.
Write Protect	Indication of whether a virtual disk can accept write data from its hosts.
Operational State	Indication of whether the snapshot is operating normally, has failed, or needs attention.
Created	Date the snapshot was created.

Table 3–5: Virtual Disk Snapshot Properties Description (Continued)

Property	Description
OS Unit ID	Unique ID required by some operating systems in order to assign the virtual disk a device name. Therefore, each virtual disk may be assigned an operating system-specific unit ID. **NOTE:** The OS Unit ID must be unique in the host cluster.
Preferred path/mode	Which controller (A or B) is the preferred path through which the snapshot is presented to its host. The choices are as follows: • No preference – Presentation of the virtual disk alternates between two controllers. • Prefer A – Controller A will present the virtual disk to hosts. • Prefer B – Controller B will present the virtual disk to hosts. • Prefer A, Failback Enabled – Controller A will present the virtual disk until failover in which case B will present. • Prefer B, Failback Enabled—Controller B will present the virtual disk until failover in which case A will present.
Hosts/LUNs/state	Indication of whether the virtual disk snapshot has been presented to hosts.

Table 3–5: Virtual Disk Snapshot Properties Description (Continued)

Property	Description
Comments	Fields are spread throughout the GUI for comments. Each comment field can contain up to 128 characters. Ways that you can use comments include the following: • Hardware locations • Past failure information • Departmental ownership

Creating a Snapshot

To create a snapshot:

1. Click the **Virtual Disk Family** icon in the **Navigation** pane for which you want to create a snapshot.

   The **Virtual Disk Family Properties** page displays (see Figure 3–8).

2. Click the **Active** icon in the **Navigation** pane.

   The **Virtual Disk Active Properties** page displays (see Figure 3–11).

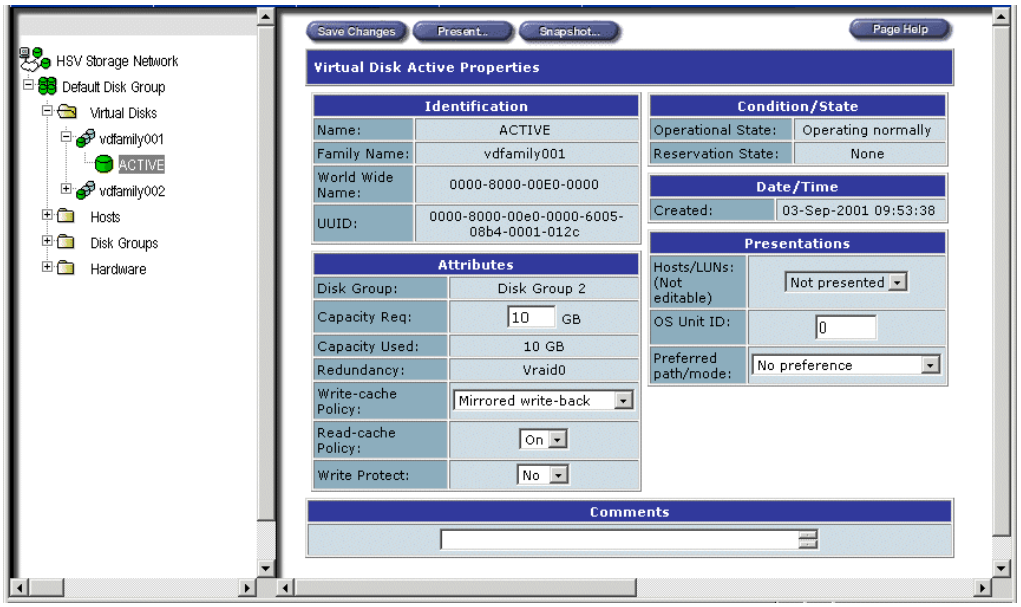


Figure 3–11: Virtual Disk Active Properties page

3. Click **Snapshot** on the **Virtual Disk Active Properties** page.

   Page 1 of the **Create a Virtual Disk Snapshot** page displays (see Figure 3–12).

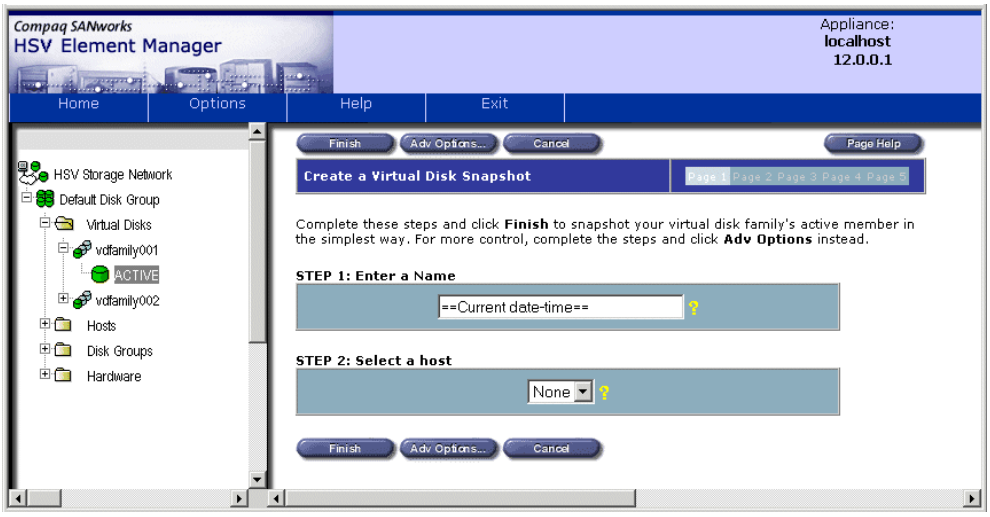


Figure 3–12: Page 1, Create a Virtual Disk Snapshot

4. Enter a name for the snapshot or use the default date and time entry in the field in STEP 1.
5. Select a host from the drop-down menu in STEP 2.
6. Click **Finish** to complete your request, or click **Adv Options** to set other snapshot properties.

Using the Snapshot Advanced Options

To use the snapshot advanced options:

1. From **Page 2** of the **Create a Virtual Disk Snapshot** page (see Figure 3–13), select a LUN address from the drop-down menu in STEP 3, if presented.

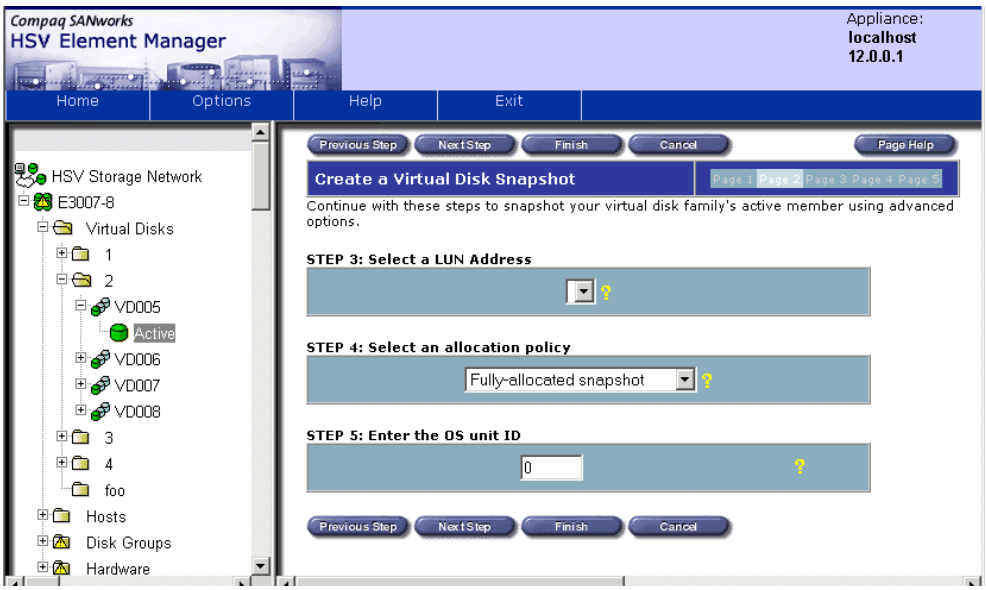


Figure 3–13: Page 2, Create a Virtual Disk Snapshot

2. Select an allocation policy from the drop-down menu in STEP 4.

   NOTE: If allocation on demand is selected, the disk group must be of sufficient size to handle expansion of the virtual disks. Allocation on demand is space-efficient; however, if the combined space used on the Active disk and the snapshot gets sufficiently large, the disk group may not be able to contain them. When the combined space used gets too large for the disk group, no new data can be written to the snapshot and the snapshot will need to be deleted.

3. Enter the **OS Unit ID** in the field in STEP 5.

4. Click **Next Step**.

   Page 3 of the **Create a Virtual Disk Snapshot** page displays (see Figure 3–14).

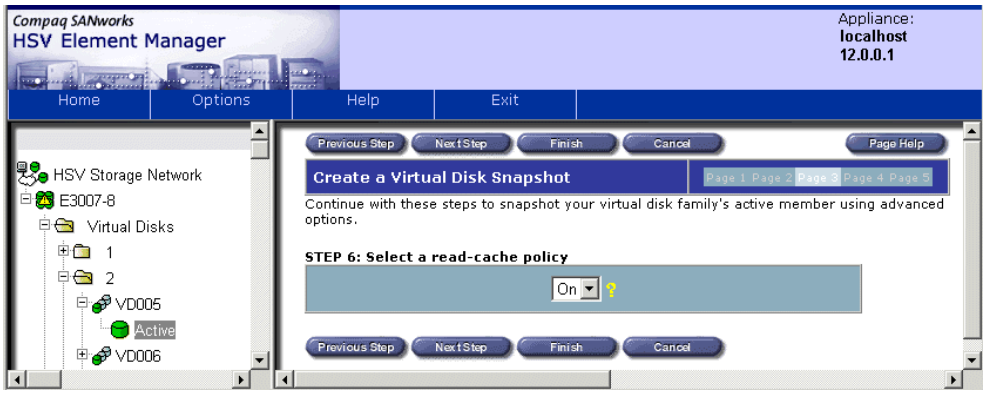


Figure 3–14: Page 3, Create a Virtual Disk Snapshot

5. Select a read-cache policy (on or off) from the drop-down menu in STEP 6.
6. Click **Next Step**.

   Page 4 of the **Create a Virtual Disk Snapshot** displays (see Figure 3–15).

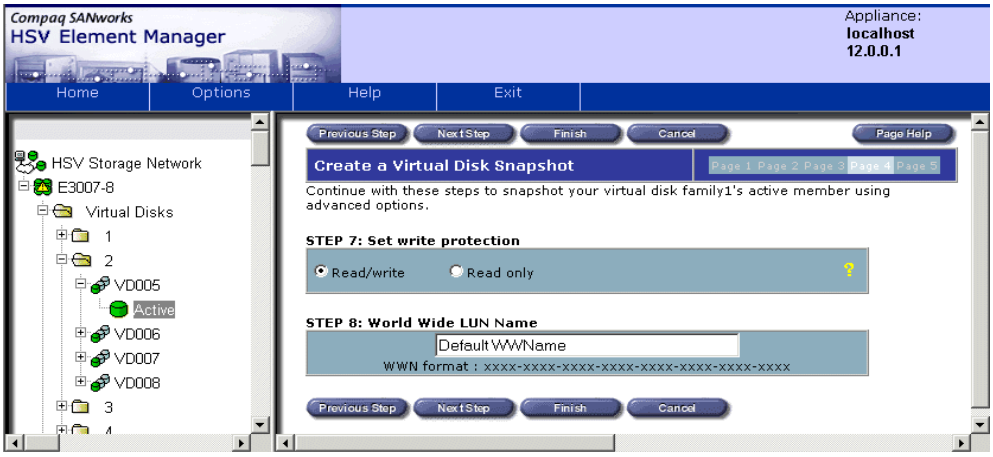


Figure 3–15: Page 4, Create a Virtual Disk Snapshot

7. Choose **Read/write** or **Read only** in STEP 7 to set the write protection level.
8. Enter the World Wide LUN name or leave Default name in STEP 8.

9. Click **Next Step**.

   Page 5 of the **Create a Virtual Disk Snapshot** page displays (see Figure 3–16).

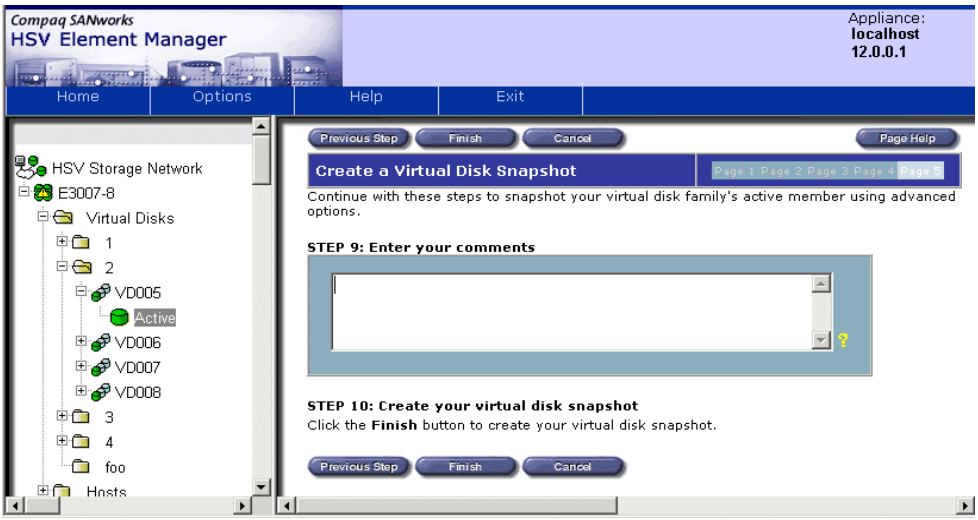


Figure 3–16: Page 5, Create a Virtual Disk Snapshot

10. Use the **Comment** field to enter any special notes regarding the snapshot.
11. Click **Finish**.

    A status page displays.

12. Click **OK** on the status page.

    The **Virtual Disk Snapshot Properties** page displays showing the properties you selected.

Modifying Snapshot Properties

The following properties can be changed from the virtual disk snapshot properties page:

- Name
- Read cache policy
- Write protection
- OS Unit ID

- Comments
- World Wide LUN Name (as long as it is not presented)

To modify a snapshot:

1. Navigate to the snapshot to be modified.
2. Make modifications in the **Virtual Disk Snapshot Properties** page.
3. Click **Save Changes**.

   The system processes the modification request, and a status page displays.
4. Click **OK**.

   An updated **Virtual Disk Snapshot Properties** page displays.

Deleting a Snapshot

To delete a snapshot:

1. Navigate to the snapshot you wish to delete in the **Navigation** pane.
2. Click **Delete**.

   A confirmation pop-up displays.
3. Click **OK.**

   A status screen displays.
4. Click **OK**.

Working with Virtual Disks

Virtualization disassociates the capacity from physical disk restrictions to create large pools of storage. For instance, if you need 1-TB of disk space, several disks could be combined in a single pool to create a 1-TB virtual disk that spans the actual physical storage. The following subsections provide procedures on:

- Presenting a Virtual Disk to a Host
- Unpresenting a Virtual Disk from a Host

- Creating a Snapclone of a Virtual disk
- Modifying a Snapclone

Presenting a Virtual Disk to a Host

Presenting a virtual disk is a process whereby the virtual disk is made visible to a host system.

To present a virtual disk to a host:

1. Select the Active virtual disk from the **Virtual Disk Active Properties** page (see Figure 3–17).

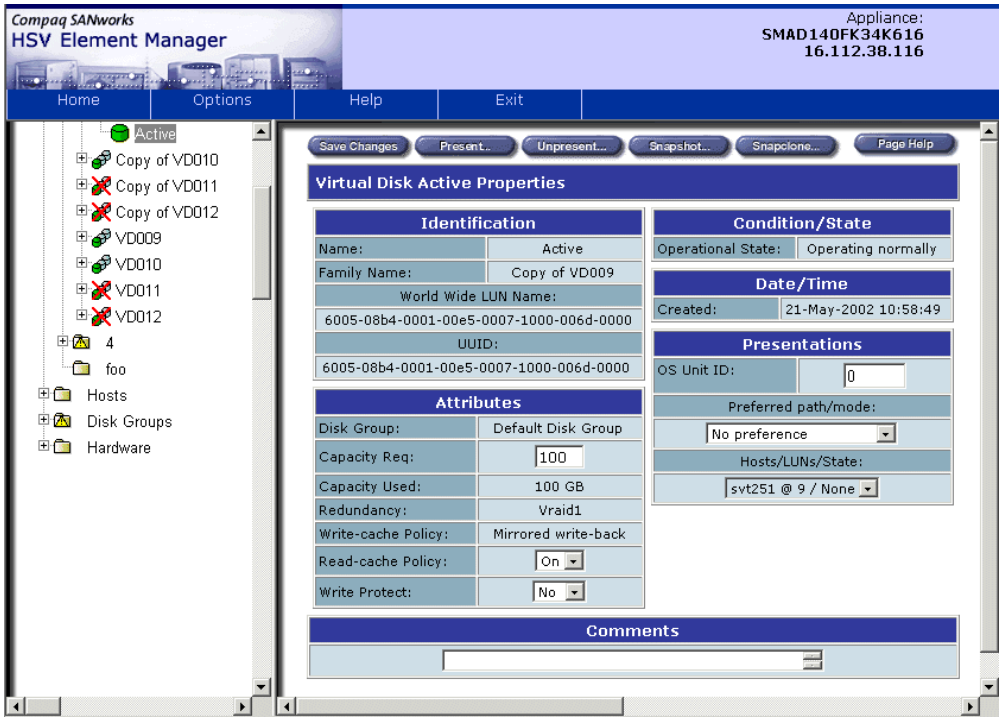


Figure 3–17: Virtual Disk Active Properties page

2. Click **Present**.

   Page 1 of the **Present Virtual Disk** page displays (see Figure 3–18).

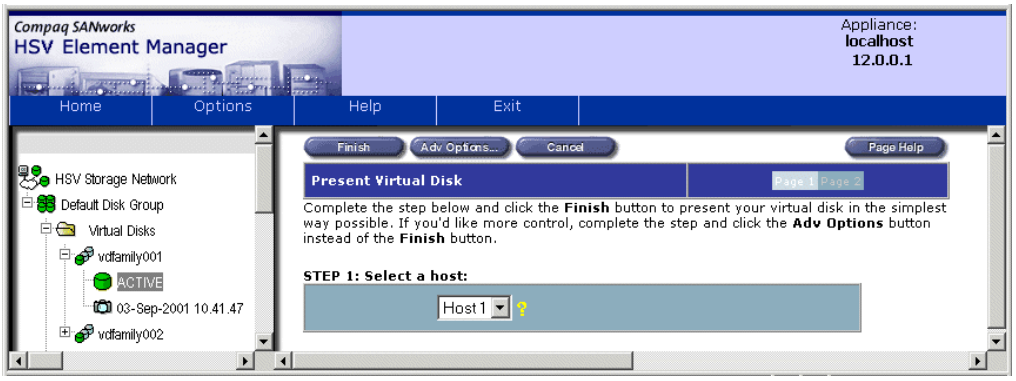


Figure 3–18: Page 1, Present Virtual Disk

3. Select a host from the drop-down menu in STEP 1.
4. Click **Finish** to complete your request, or click **Adv Options** to set other presentation properties.

Using Advanced Options on the Present a Virtual Disk Page

To use the advanced options in the **Present Virtual Disk** page:

1. On **Page 1** of the **Present Virtual Disk** page, click **Adv Options**.

   Page 2 of the **Present Virtual Disk** page displays (see Figure 3–19).

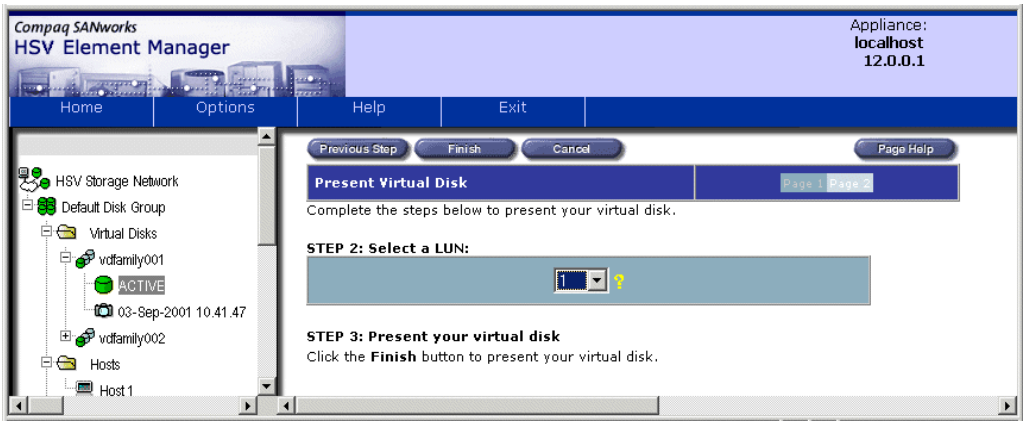


Figure 3–19: Page 2, Present Virtual Disk

2. Select a LUN number from the drop-down menu in STEP 2.

3. Click **Finish** to execute the request.

   A status page displays.

4. Click **OK**.

   The updated **Virtual Disk Active Properties** page displays.

   IMPORTANT: After the disk is presented, verify that the host can see the virtual disk (see the storage system software documentation for the host's operating system information).

Unpresenting a Virtual Disk

To unpresent a virtual disk:

1. Navigate to the **Virtual Disk Properties** page (see Figure 3–17).

2. Click **Unpresent**.

The **Delete Virtual Disk Presentation** page displays (see Figure 3–20).

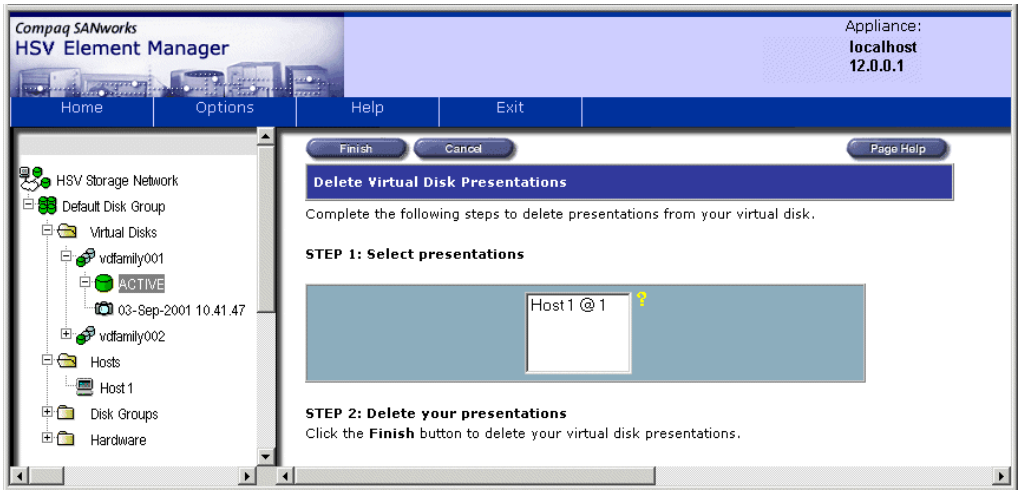


Figure 3–20: Delete Virtual Disk Presentation page

3. Select the presentation you want to delete from the **Select presentations** list in STEP 1.

4. Click **Finish**.

   A status page displays.

5. Click **OK**. The **Virtual Disk Active Properties** page displays (see Figure 3–17).

6. Verify under the Presentations section of the **Virtual Disk Active Properties** page that the selected host is not listed.

Working with Snapclones

A Virtually Instantaneous Snapclone is a virtual disk that is an exact copy of another virtual disk. You can only create a Snapclone of the Active member of a virtual disk family.

The Snapclone, like a snapshot, reflects the contents of the source virtual disk at a particular point in time. Unlike the snapshot, the Snapclone is an actual clone of the source virtual disk and becomes an independent Active member of its own virtual disk family.

Although the Snapclone can be read from and written to immediately upon its presentation, an invisible background process fully separates the Snapclone from the original virtual disk which it replicates. While the disk is being copied in this background process, neither the original virtual disk nor the Snapclone can be copied again, nor can a snapshot be made of either virtual disk.

IMPORTANT: The Snapclone process require a specific, value-added license.

NOTE: The Snapclone is a clone of the source virtual disk at the instant of the Snapclone's creation. The time required to completely perform the Snapclone operation depends on the size of the source virtual disk.

Creating a Snapclone

To create a Snapclone of an Active source virtual disk:

1. Expand a selected virtual disk folder in the **Navigation** pane.
2. Click a virtual disk family icon, then click the **Active** icon.

   The **Virtual Disk Active Properties** page displays (see Figure 3–17).
3. Click **Snapclone**.

Page 1 of the **Create a Snapclone** page displays (see Figure 3–21).

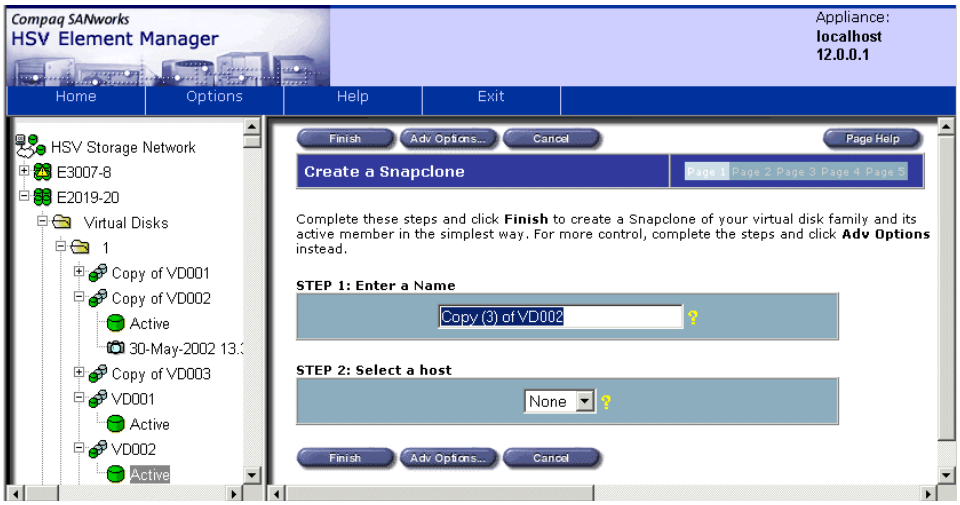


Figure 3–21: Page 1 of the Create a Snapclone page

4. Enter a name for the virtual disk snapclone in STEP 1.
5. Select the host to which the virtual disk copy will be presented from the drop-down menu in STEP 2.
6. Click **Finish** or click **Adv Options** to set other snapshot properties.

Using the Create a Virtual Disk Snapclone Advanced Options

The advanced options for creating a virtual disk Snapclone allow you to do the following:

- Select a LUN Address (if a host was selected in Step 2).
- Select a path preference and mode.
- Specify the OS unit ID.
- Select a Disk Group.
- Select a read-cache policy.
- Set write protection.
- Enter the World Wide Name.
- Make any comments regarding the advanced options.

To use the Snapclone advanced options:

1. On **Page 1** of the **Create a Snapclone** page, click **Adv Options** after you have completed Page 1.

   Page 2 of the **Create a Snapclone** page displays (see Figure 3–22).

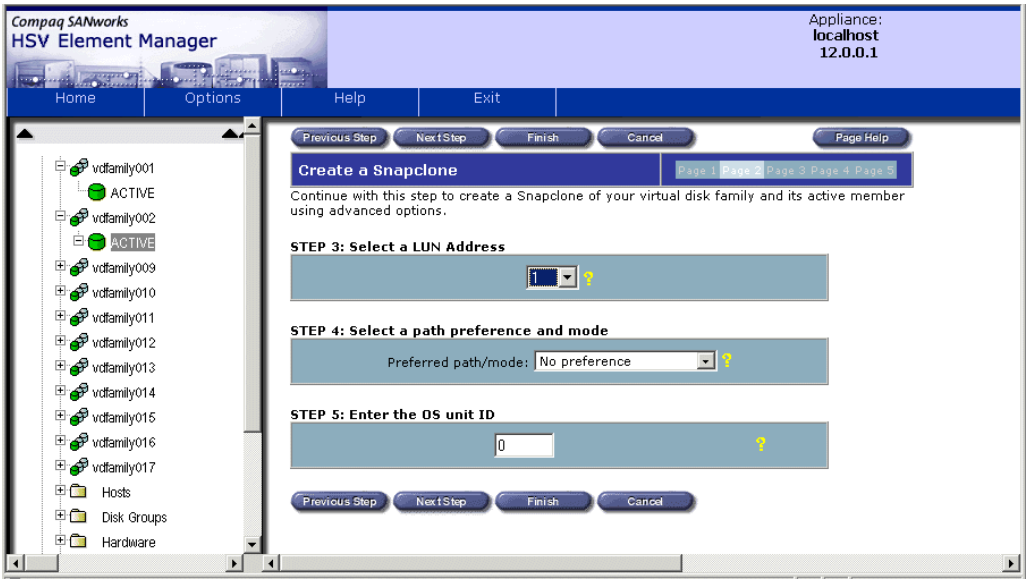


Figure 3–22: Page 2 of the Create a Snapclone page

2. Select a LUN address from the drop-down menu in STEP 3.
3. Select the path preference and mode from the drop-down menu in STEP 4.
4. Enter the OS Unit ID in the field in STEP 5.
5. Click **Next Step**.

Page 3 of the **Create a Snapclone** page displays (see Figure 3–23).

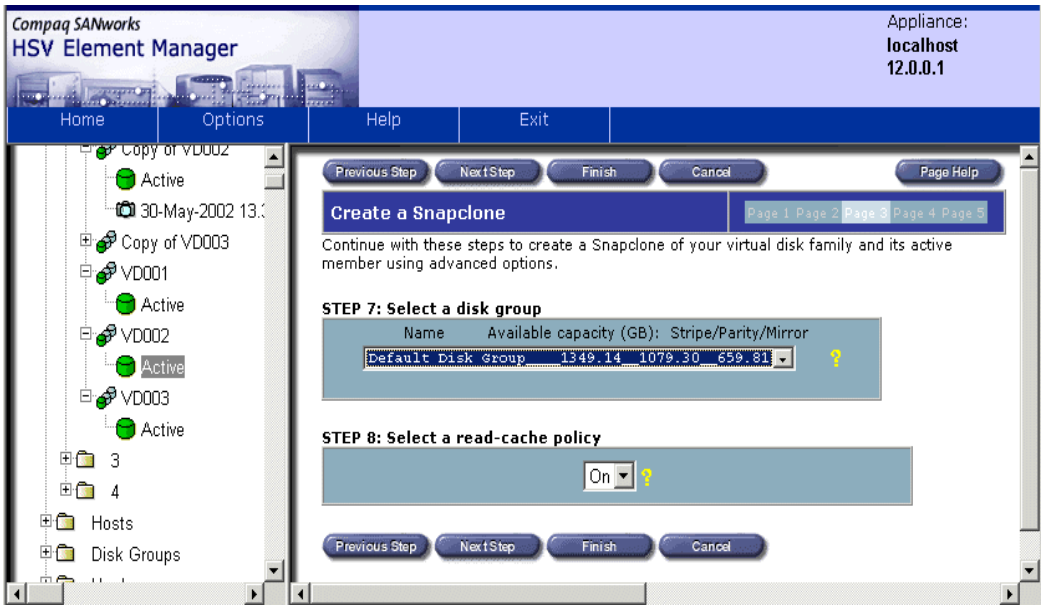


Figure 3–23: Page 3 of the Create a Snapclone page

6. Select a disk group from the drop-down menu in STEP 7.
7. Select a read-cache policy from the drop-down menu in STEP 8.
8. Click **Next Step**.

Page 4 of the **Create a Snapclone** page displays (see Figure 3–24).

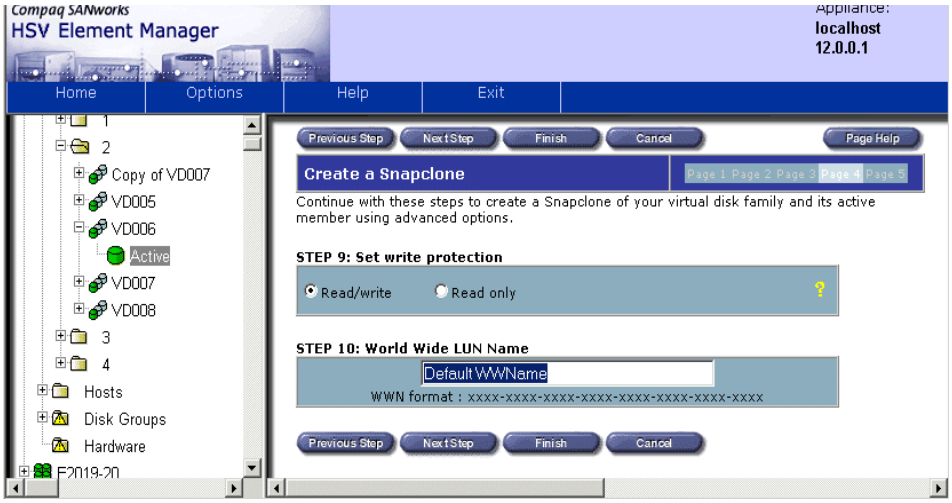


Figure 3–24: Page 4 of the Create a Snapclone page

9. Select **Read/Write** or **Read Only** to set the write protection level in STEP 9.
10. Enter the **World Wide LUN Name** in STEP 10.
11. Click **Next Step**.

Page 5 of the **Create a Snapclone** page displays (see Figure 3–25).

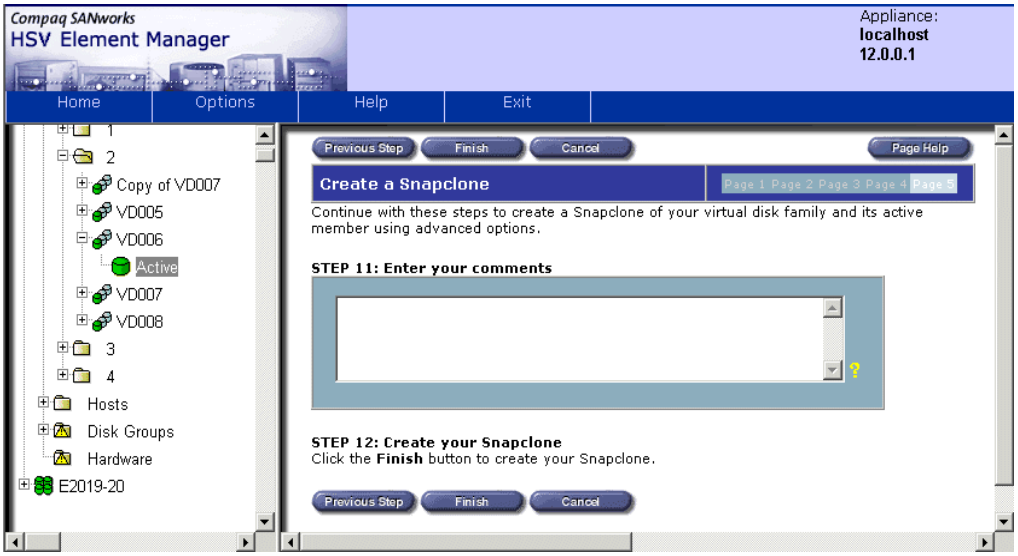


Figure 3–25: Page 5 of the Create a Snapclone page

12. Use the **Comment** field in STEP 11 to type any special notes regarding the virtual disk Snapclone.
13. Click **Finish.**

    A status page displays.
14. Click **OK** on the status page.

The **Virtual Disk Family Properties** page displays with configured properties (see Figure 3–26).

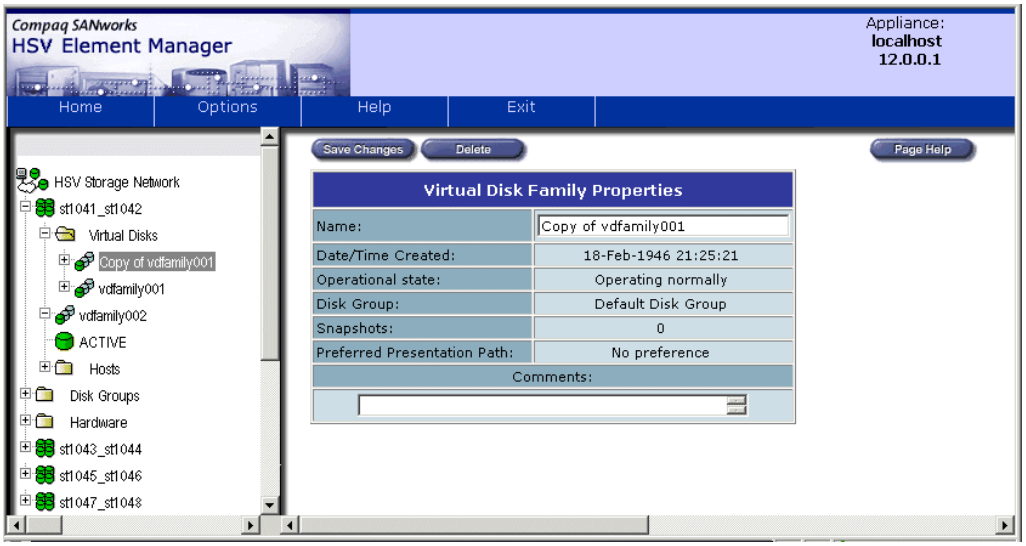


Figure 3–26: Virtual Disk Family Properties page

Modifying a Snapclone Virtual Disk

A Snapclone virtual disk is actually the Active member of its own family. The following properties can be changed from the Active member of a Virtual Disk Family Snapclone Properties page after it is presented to the host:

- World Wide LUN Name
- Read cache policy
- Write protection
- OS Unit ID
- Preferred Path/Mode
- Capacity Requested
- Comments

To make modifications:

1. Navigate to the virtual disk needing modification.

2. Make necessary changes on the **Virtual Disk Active Properties** page and click **Save Changes**.

   A status page displays.

3. Click **OK.**

Working with Hosts

A host is a computer that runs user applications and uses (or can potentially use) one or more virtual disks created and presented by the controller pair. Each host connects to the fabric through one or more Fibre Channel Adapters (FCAs). An FCA is an adapter used to connect the host to the fabric and enables the host to use the Fibre Channel transmission protocol.

Each Fibre Channel port on a host adapter has a World Wide Name (WWN). Typically, the host operating system will report the WWNs of all the FCA ports in the host. The WWN also appears on a sticker on the FCA board.

When you click the **Hosts** icon in the **Navigation** pane, the **Host Folder Properties** page displays (see Figure 3–27).

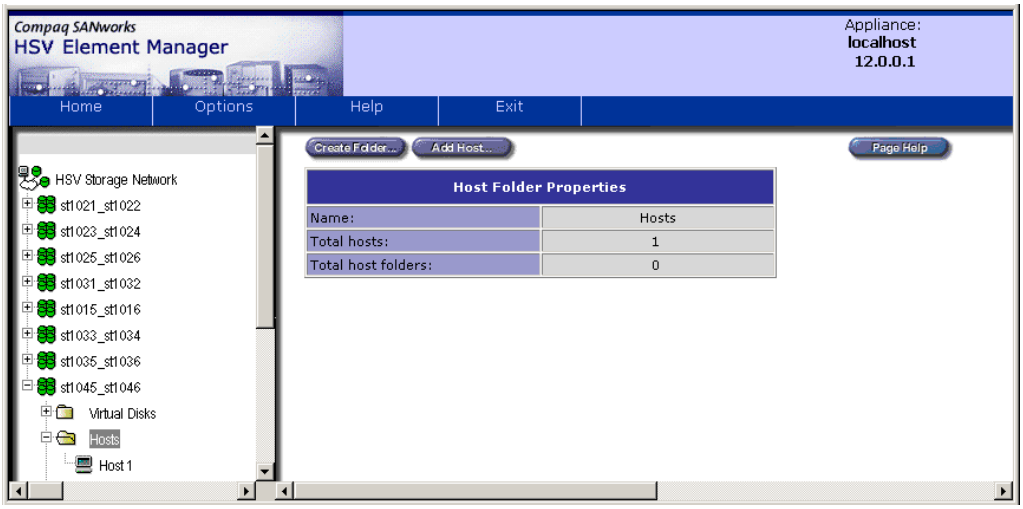


Figure 3–27: Host Folder Properties page

Table 3–6 provides descriptions for the properties displayed on **Host Folder Properties** page.

Table 3–6: Host Folder Property Descriptions

Property	Description
Name	Name assigned to a host folder. The maximum length is 32 characters.
Total Hosts	Number of hosts that are in this folder only, excluding its subfolder(s).
Total Host Folders	Total number of subfolders in this folder.

Click a host icon in the **Hosts** to display the **Host Properties** page (see Figure 3–28).

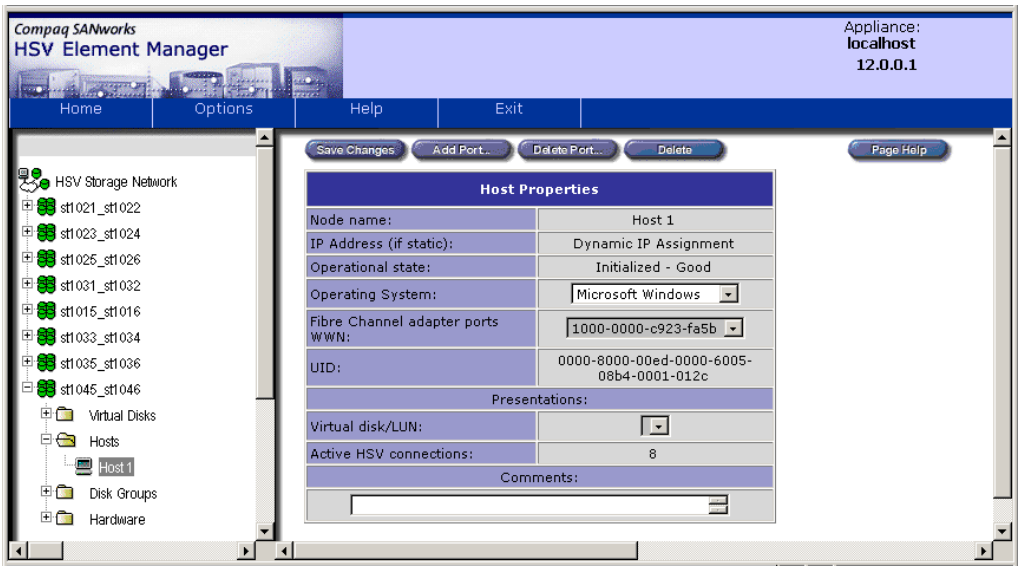


Figure 3–28: Host Properties page

Table 3–7 provides descriptions of the properties in the **Host Properties** page.

Table 3–7: Host Properties Page Descriptions

Property	Description
Node Name	The LAN Node Name of the host.

Table 3–7: Host Properties Page Descriptions (Continued)

Property	Description
IP Address (if static)	IP (internet protocol) Address in the form of 123.76.54.156. Each of the four sections is a decimal number from 0 to 255. Part of the address specifies a network, and the rest of the address specifies a specific host on that network.
Operational state	Three states that indicate whether the host is visible or needs attention: • Good • Attention or Warning • Failed
Operating System	Drop-down menu that contains a list of operating systems.
Fibre Channel Adapter Ports WWN	List of the WWIDs of the host adapters enabled to access the storage system.
UID	Universal unique identification number. Both the controller software and the element manager software are object-oriented. Each object in a storage system, whether a hardware element or a software structure, has a unique universal identifier, or UUID. The various objects on a storage system use the UUID to identify each other.
Virtual Disk/LUN	Virtual disks that are presented to this host and the Active LUNs at which they are presented. The syntax is Active virtual_disk_name @ LUN#. For example, ENG01\Active @ 3 means that the Active member of a virtual disk named ENG01 is presented to this host at LUN 3.
Active HSV Connections	Number of active HSV connections to the host.
Comments	Comment fields that are spread throughout the GUI. Each comment field can contain up to 128 characters. Ways that you can use comments include the following: • Hardware locations • Past failure information • Departmental ownership

Host management tasks include the following:

- Adding a Host
- Deleting a Host
- Modifying Host Properties

Adding a Host

Before a host can use the storage system's virtual disks, the host must be known to the storage system. This process is called adding a host. Adding a host creates a path from the storage system to one host adapter. More host adapters can be specified as a modification to the host properties.

To add a host:

1. On the **Host Folder Properties** page, click **Add Host** (see Figure 3–27).

   Page 1 of the **Add a Host page** displays (see Figure 3–29).

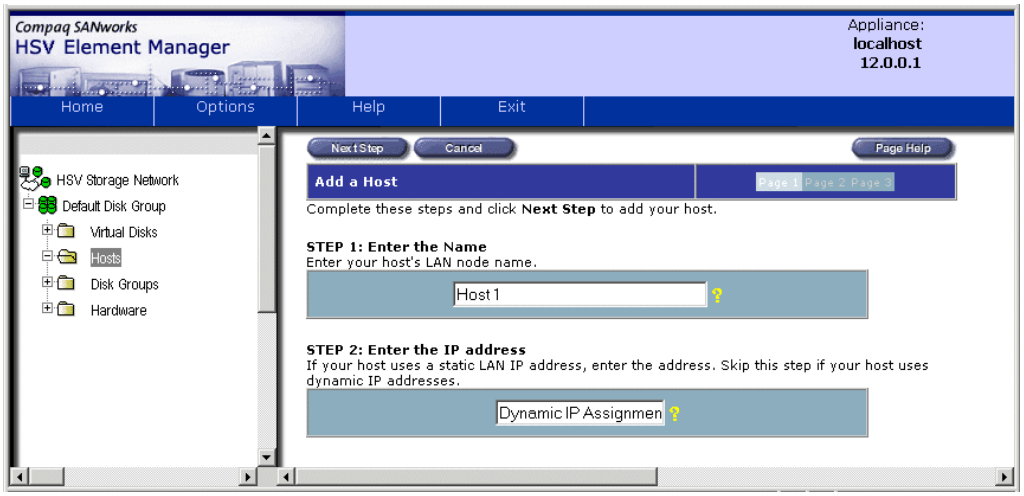


Figure 3–29: Page 1, Add a Host

2. Enter a name for the Host in the **Enter the Name** field in STEP 1.
3. Enter the IP address in the field in STEP 2.

IMPORTANT: If the host uses DHCP, do not change the field.

4. Click **Next Step**.

Page 2 of the **Add a Host** page displays (see Figure 3–30).

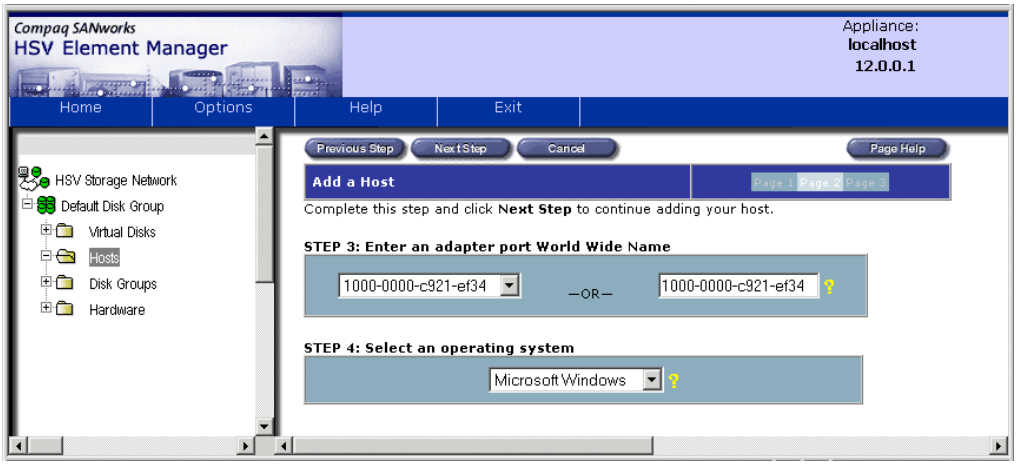


Figure 3–30: Page 2, Add a Host

5. Either select an adapter port WWN from the drop-down menu, or enter the exact port WWN in STEP 3.
6. Select an operating system from the drop-down menu in STEP 4.
7. Click **Next Step**.

   Page 3 of the **Add a Host** page displays (see Figure 3–31).

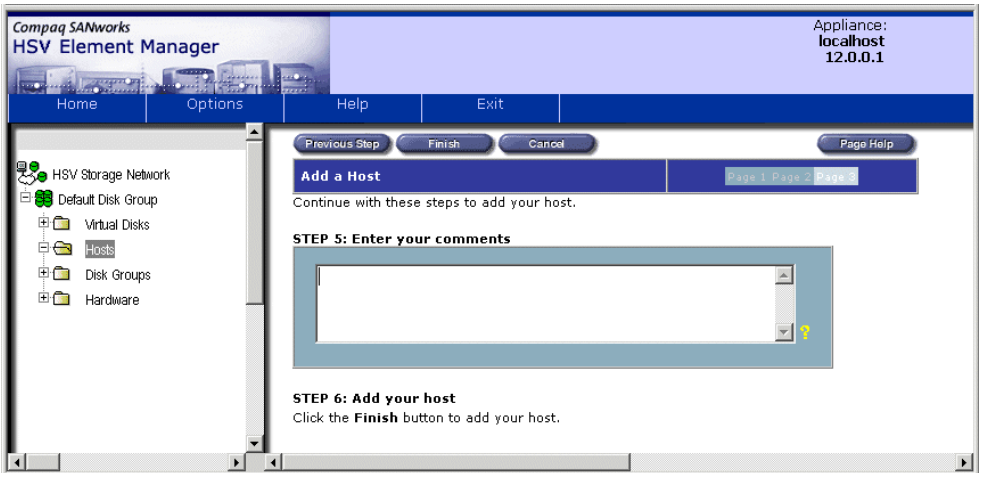


Figure 3–31: Page 3, Add a Host

8. Enter **comments** (if desired) regarding the host addition.
9. Click **Finish**.

   A status page displays.
10. Click **OK**.

    An updated **Host Properties** page displays (see Figure 3–28).

Deleting a Host

To delete a host:

1. Navigate to the **Host Properties** page (see Figure 3–28).
2. Click **Delete**.

   A pop-up displays informing you that all port settings associated with the host will be lost.
3. Click **OK** to proceed.

A status page displays.

4. Click **OK**.

   An updated **Host Folder Properties** page displays showing the number of remaining hosts (see Figure 3–27).

Modifying Host Properties

You can only change the following host properties:

- Operating System
- Comments

NOTE: For any other changes, the host must be deleted and added again.

Working with Ports

The port options available from the **Host Properties** page lets you create the additional path to a host by specifying the World Wide Name (WWN) of one of the host adapters. A host adapter, or host bus adapter, is a hardware device that is installed in a host computer and enables the host to use the Fibre Channel transmission protocol.

The following subsections discuss procedures for completing the following port management tasks:

- Adding a Port
- Deleting a Port

Adding a Port

To add a port:

1. Expand a **Hosts** folder in the **Navigation** pane.
2. Select a host.

   The **Host Properties** page displays (see Figure 3–28).
3. Click **Add Port**.

   The **Add a Host Port** page displays (see Figure 3–32).

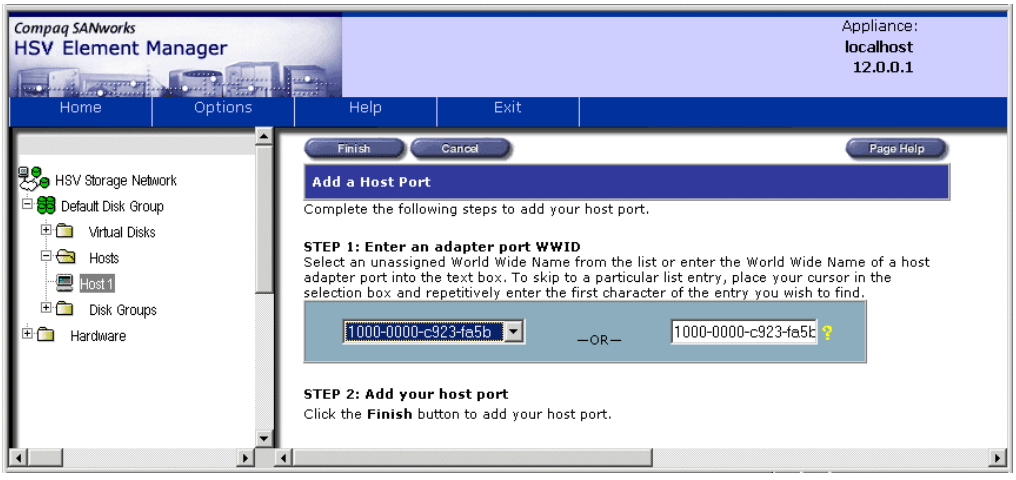


Figure 3–32: Add a Host Port page

4. Select a port adapter WWN from the drop-down menu or manually enter the exact adapter port WWN in the appropriate field in STEP 1.
5. Click **Finish**.

   A status page displays.
6. Click **OK**.

   An updated **Host Properties** page displays (see Figure 3–28).

Deleting a Port

To delete a port:

1. Select a host.
2. Navigate to the **Host Properties** page (see Figure 3–28).
3. Click **Delete Port**.

   The **Delete a Host Port** page displays (see Figure 3–33).

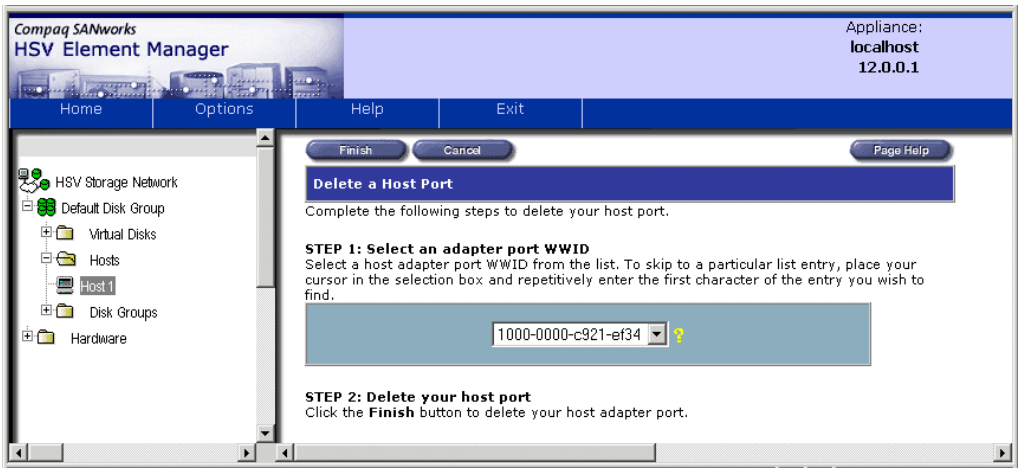


Figure 3–33: Delete a Host Port page

4. Select the port to be deleted from the drop-down menu on the **Delete a Host Port** page.
5. Click **Finish**.

   A status page displays.

6. Click **OK**.

   An updated **Host Properties** page displays.

4

Monitoring the Storage System

Each installation of the HSV Element Manager is a management agent. This management agent monitors the storage system by forwarding and reporting user selected events using Simple Network Management Protocol (SNMP) traps. An event is any change that is significant to the storage system. Events include the following:

- Hardware state changes
- State changes in a logical element, such as a virtual disk
- Procedure completions
- Environmental changes
- Operational changes

The HSV Element Manager reports the following events:

- Management agent events
- Controller (storage subsystems) events
- Disk enclosure events
- Termination events

Reporting events involves setting up and configuring the following:

- Copying or loading the event parse file
- Configuring an event notification file
- Configuring a host notification file

SNMP-Enabled Hosts

Simple Network Management Protocol (SNMP) is an event reporting system. The storage system can be configured to report event information to specified computers using SNMP.

SNMP-enabled systems can be designated as collection points for the SNMP traps the management agent generates to record events. Any computer on the same network as the storage system can be SNMP-enabled.

SNMP Traps

An SNMP trap is a short message sent to SNMP-enabled hosts notifying them that an event has occurred on the storage system.

SNMP Trap Events

The format definition of the traps is contained in the CPQHSV110.mib file which can be retrieved from the **Set Event Notification Options** page.

The traps generated by the HSV Element Manager are the following:

- Storage system spontaneous events
- Drive enclosure events for four severity levels
- Management agent events

Storage System Spontaneous System Event Traps

One trap is defined for every storage system spontaneous event. See Table 4–1 for explanation of fields in a trap for a storage system spontaneous event.

Table 4–1: Storage System Spontaneous Event Field Descriptions

Field	Description
Date/Time	String with date and time information: • Format: DD-MM-YYYY/HH:MM:SS • Example: 14-Mar-2001/17:17:17
Storage System Event Code	String where the values present hex values for software ID, event number, corrective action code, and EIP type. Format: aa bb cc dd Example: 9 33 0 e
SW ID	String where the values present decimal values for software ID.
Event Number	String where the values present decimal values for event number.
CAC	String where the values present decimal values for CAC.

Table 4–1: Storage System Spontaneous Event Field Descriptions (Continued)

Field	Description
EIP type	String where the values present decimal values for EIP type.

Disk Enclosure Event Traps

One drive enclosure event trap is defined for each of four severity levels:

- Informational
- Non-critical
- Critical
- Unrecoverable

Table 4–2 explains the fields that each trap will contain.

Table 4–2: Disk Enclosure Event Field Descriptions

Field	Description
ShelfID	Integer that represents the shelf number location of the EMU.
Element Type.	Integer that represents the element type the event references.
Error Code	Integer that represents an error code.
StorageCell Name	String that is the name of the storage system.
Date/Time field	String with date and time information. • Format: DD-MM-YY/HH:MM:SS • Example: 14-3-01/16:17:17

Management Agent Event Trap

One event trap definition is defined for every management agent event. Table 4–3 explains the fields that each trap contains.

Table 4–3: Management Agent Event Trap Field Descriptions

Field	Description
Host Name	String which is the name of the appliance generating the trap.
StorageSystem Name:Date and Time	Storage system name: A string with date and time information. Example: StorageSystemname:14-Mar-2001/16:17:17
Event Code	Integer representing the event code defined in the management agent.
Description	Text description.

Management Agent Events

Management agent events consist of two types of significant occurrences:

- Change in the state of the management agent software
- Change in the state of an initialized storage system that the management agent is controlling or monitoring.

Logging Management Agent Events

Management agent events are logged to the Management Agent Event log when they occur. The Management Agent Event log lists the events in table format (see Figure 4–1).

To access the **Management Agent Event** log:

- Click **View Events** on the **Initialized Storage System Properties** page.
- Click the Management Agent Event log **View** button.

Management Agent Events

	Date	Time	Appliance	Code	Alarm	Description
✔	5-Sep-2001	11:31:15	SAM007	2026	No	Device Added Successfully
✔	5-Sep-2001	11:31:15	SAM007	2034	No	Change Device Usage Complete
✔	5-Sep-2001	11:31:01	SAM007	2026	No	Device Added Successfully
✔	5-Sep-2001	11:31:01	SAM007	2034	No	Change Device Usage Complete
✔	5-Sep-2001	11:30:39	SAM007	2026	No	Device Added Successfully
✔	5-Sep-2001	11:30:39	SAM007	2034	No	Change Device Usage Complete
✔	5-Sep-2001	11:29:49	SAM007	2026	No	Device Added Successfully
✔	5-Sep-2001	11:29:49	SAM007	2034	No	Change Device Usage Complete
✔	5-Sep-2001	11:29:25	SAM007	2026	No	Device Added Successfully
✔	5-Sep-2001	11:29:25	SAM007	2034	No	Change Device Usage Complete
✔	5-Sep-2001	11:29:06	SAM007	2026	No	Device Added Successfully
✔	5-Sep-2001	11:29:06	SAM007	2034	No	Change Device Usage Complete
✔	5-Sep-2001	11:27:43	SAM007	2052	No	Object modification for disk group - Complete
✔	5-Sep-2001	11:21:07	SAM007	2051	No	Create Folder - Completed
✔	5-Sep-2001	11:20:34	SAM007	2051	No	Create Folder - Completed
✔	5-Sep-2001	11:17:51	SAM007	9012	No	Operation on a fast virtual disk deletion completed
✔	5-Sep-2001	11:17:51	SAM007	9012	No	Operation on a fast virtual disk deletion completed
✔	5-Sep-2001	11:17:22	SAM007	2048	No	Virtual Disk Family: vdfamily003 - deleted successfully
✔	5-Sep-2001	11:17:02	SAM007	9012	No	Operation on a fast virtual disk deletion completed
✔	5-Sep-2001	11:17:01	SAM007	1014	No	The state of an object in the system has changed. View adjacent events for more detail.
✔	5-Sep-2001	11:16:51	SAM007	2048	No	Virtual Disk Family: vdfamily002 - deleted successfully
✔	5-Sep-2001	11:16:37	SAM007	2048	No	Virtual Disk Family: vdfamily001 - deleted successfully
✔	5-Sep-2001	11:16:27	SAM007	2048	No	Snapshot Virtual Disk: 04-Sep-2001 10.35.05 - deleted successfully
✔	5-Sep-2001	11:16:16	SAM007	10015	No	Command rejected - The virtual disk has a sharing relationship with another object

Figure 4–1: Management Agent Events log page

Table 4–4 explains the headings of the Management Agent Events log.

Table 4–4: Management Agent Events Log Heading Descriptions

Heading	Description
Date and time	Date and time the event occurred.
Appliance	Name of the Management Appliance the management agent is running on.
Code	Error number that corresponds to an event description.
Alarm	An indication that an alarm (SNMP trap) has been sent on an event. If this event has been configured to send an SNMP trap, the event will also be entered into the Management Appliance Event log.

Table 4–4: Management Agent Events Log Heading Descriptions (Continued)

Heading	Description
Description	Description of the event.

Filtering Events in the Management Agent Event Log

You can use filtering parameters to customize your display of the Management Agent Event log. (see Figure 4–2). To display the **Filter Events** page, click **Filter Events** on the **Management Agent Events** page.

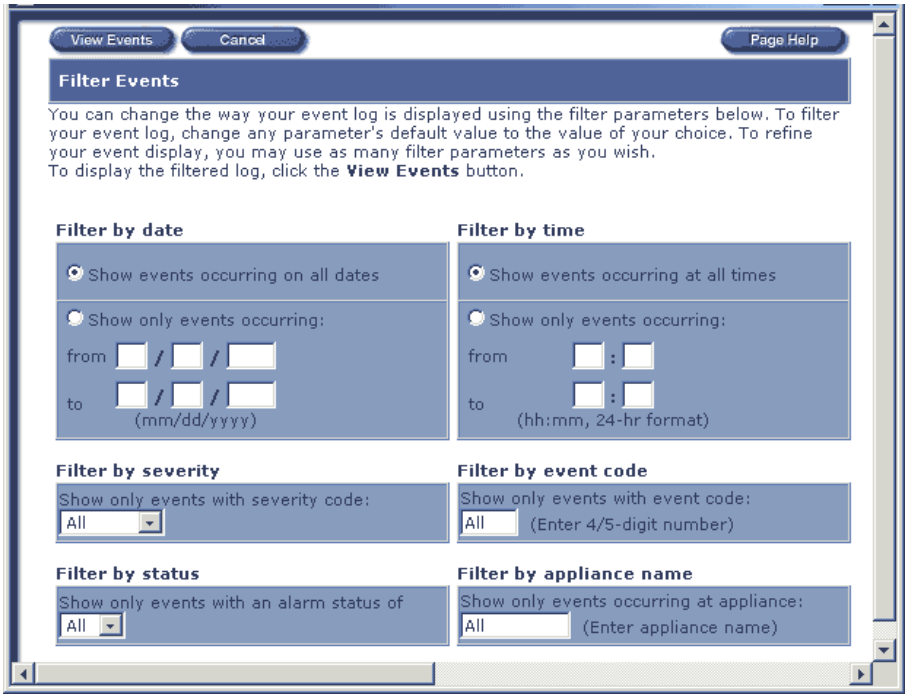


Figure 4–2: Filtering Events page

NOTE: This is a filter of the existing event log for viewing purposes only. It will not affect which events get logged; it merely allows you to be selective in your viewing of the log.

To filter management agent events:

1. Refine the event display using as many filter parameters as needed (see Table 4–5).

2. Click **View Events.**

   The **Management Agent Event** log displays according to the new parameters.

Table 4–5: Management Agent Event Filter Descriptions

Filter	Description
Date or time	Date or time relative to the Management Appliance running this management agent.
Severity	One of the following: • Normal – Occurs within all operational parameters of the management agent and the storage system (normal events are usually associated with typical user storage management actions). • Warning – If not tended to, could lead to the management agent and the storage system becoming inoperable or cause the management agent and the storage system to run in a degraded fashion. • Critical – Likely prevents further operation of the management agent and the storage system.
Event Codes	Specific event code to be recorded
Alarm Status	One of the following: • All – Displays all events whether an alarm was sent or not. • No – Displays only events that have NOT had an alarm (SNMP trap) sent. • Yes – Displays only events that have had an alarm (SNMP trap) sent.
Appliance	Name of the Management Appliance whose management agent recorded the events

Controller Events

Controller events are significant occurrences to any hardware or software component of the storage system. The controller provides the event information via an event log. The management agent polls the event log and the controller pair at regular intervals for event information. The Controller Event log lists the events in table format (see Figure 4–3).

To display the **Controller Events** page, click the Controller Event Log **View** button on the **View Events** page.

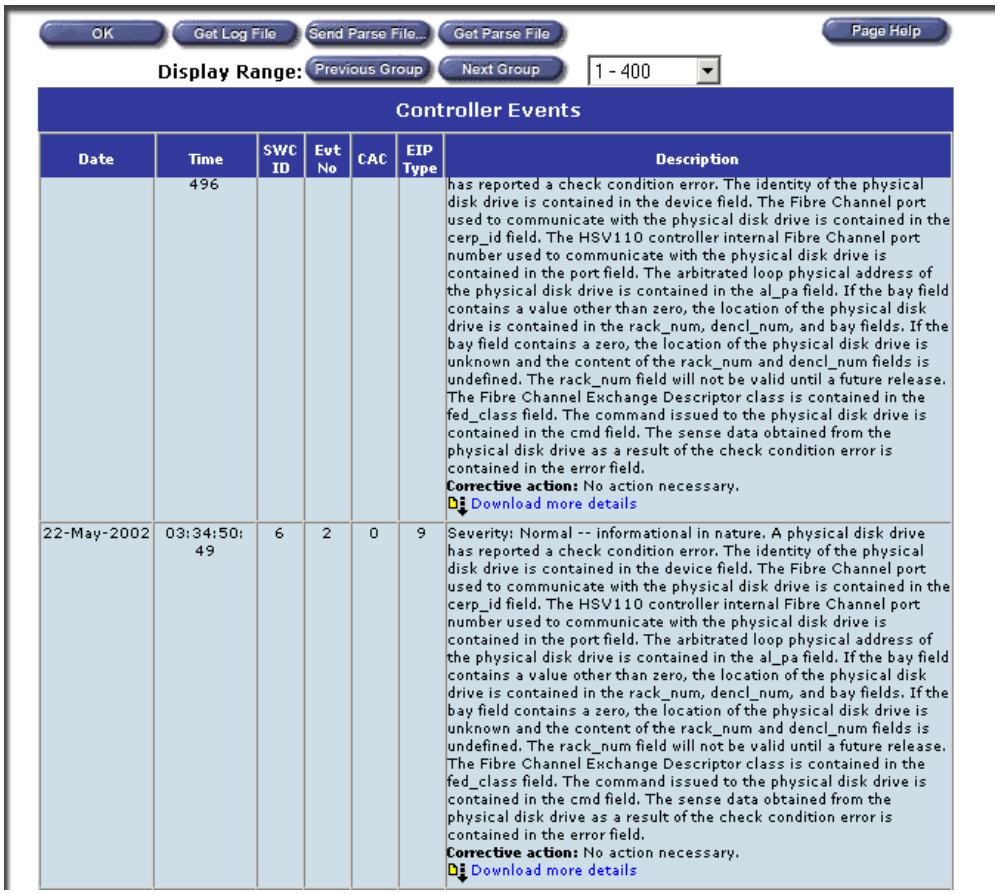


Figure 4–3: Controller Events log page

Table 4–6 explains the **Controller Events** page headings.

Table 4–6: Controller Events Page Headings Description

Table Heading	Description
Date and time	Date and time of the event.
SWC ID	The software component that reported the error.

Table 4–6: Controller Events Page Headings Description (Continued)

Table Heading	Description
EVT No	The event number, that when combined with the SWC ID, uniquely identifies the event being reported.
CAC	Corrective action codes.
EIP type	The event information packet type. Each packet type has a unique template that describes the significance of fields in the information packet.
Description	Description of the event.

Disk Enclosure Events

A disk enclosure event is a significant occurrence to or within the hardware or software of the disk drive enclosure. The Environmental Monitoring Unit (EMU) of the disk drive enclosure reports these events in the controller event log along with other controller events.

Termination Events

Termination events report why a controller ceased operation. Termination event information describes the cause of the event (see Figure 4–4). Click the Controller Termination Event log **View** button to display the **Termination Events-Controller** page.

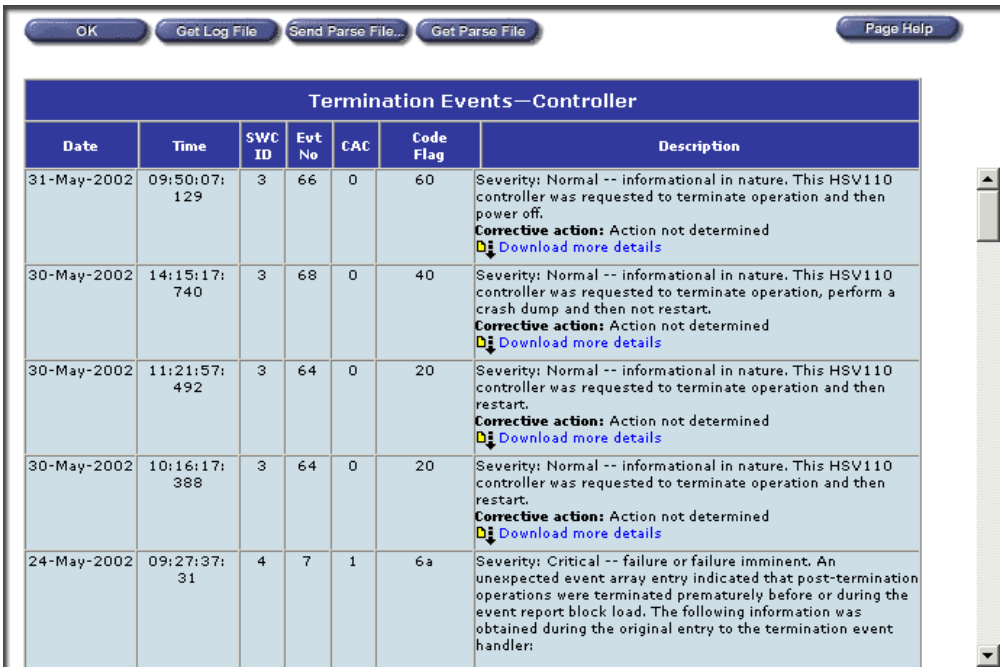


Figure 4–4: Termination Events – Controller log page

Table 4–7 explains the table headings in the termination event log.

Table 4–7: Termination Event Log Heading Descriptions

Heading	Description
Date	Date of the event
Time	Time of the event
SWC ID	The software component that reported the error.
EVT No	Controller software module that reported the error.
CAC	Corrective action codes.
Code Flag	Event-specific code.
Description	Description of the event.

Viewing Events

Both the management agent and the storage system report events. The following files affect how events are displayed and how SNMP traps are sent:

- Storage system event parse file
- Event notification file
- Host notification file

Figure 4–5 shows how the events are collected and reported.

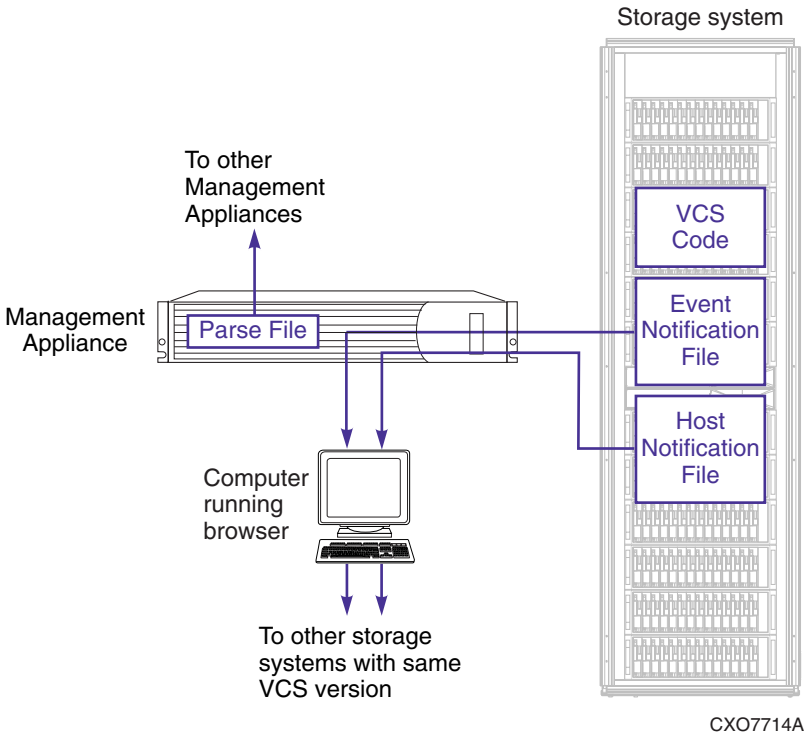


Figure 4–5: Event Display

System Time and Date

The system time and date comprise the controller pair's internal time stamp.

The options are:

- Time of the Management Appliance on which the management agent runs.
- Local time is supplied by the computer on which the browser runs.
- Existing controller time is the current setting of the controller pair's real-time clocks.
- A custom time entered in the drop boxes. A custom time is useful for measuring elapsed time. An example of using a custom time: Setting the time to all zeroes in order to time an event.

IMPORTANT: The default time is the Management Appliance time. It is recommended that you use the default.

To set the time:

1. Navigate to the **System Options** page (see Figure 4–6) by clicking the **Options** button on the **Initialized Storage System** page.

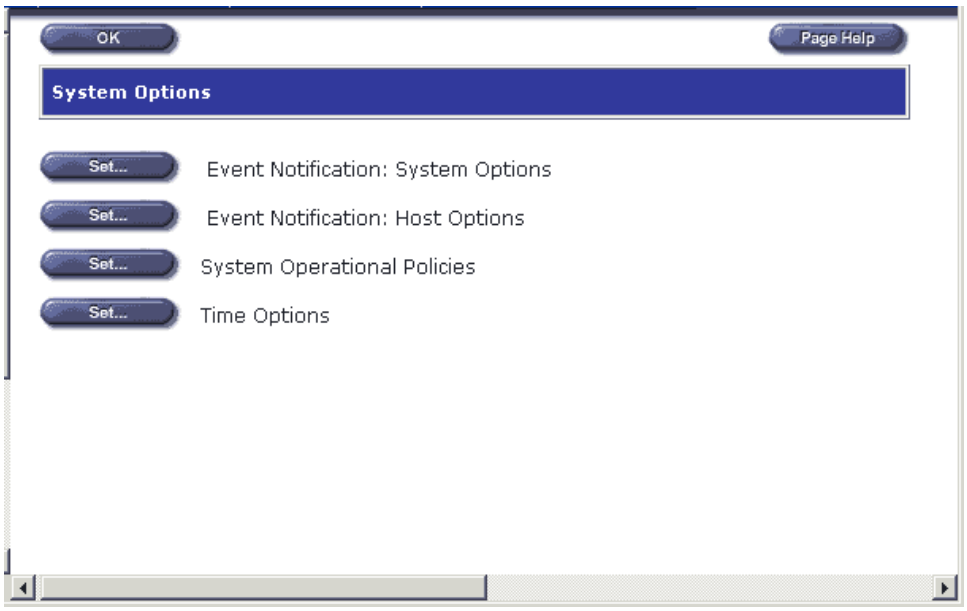


Figure 4–6: System Options page

2. Click **Set** Time Options.

   The **Set System Time** page displays (see Figure 4–7).

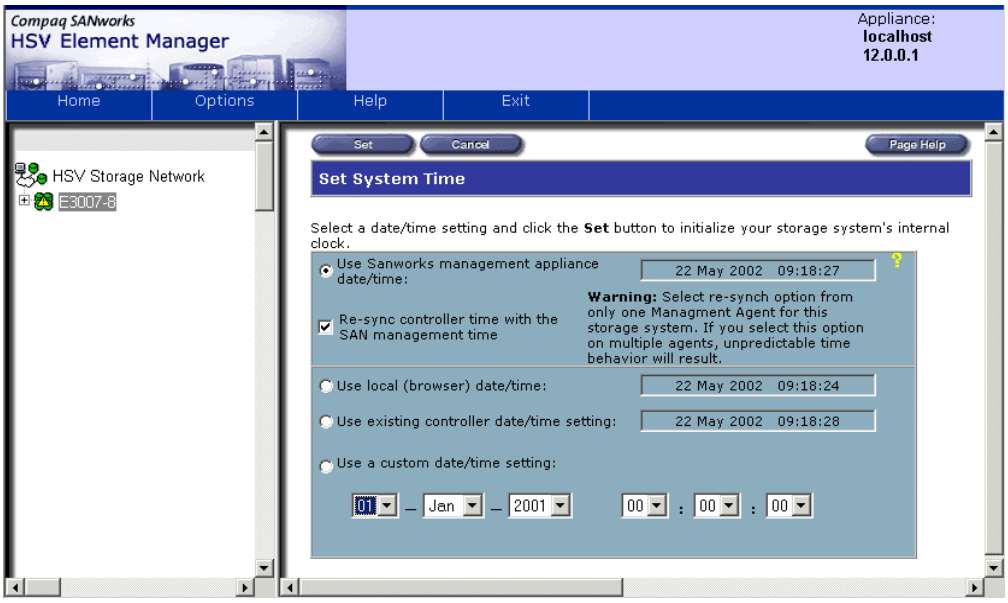


Figure 4–7: Set System Time page

3. Click one of the options or fill in the boxes to set a custom time.

   NOTE: Re-sync controller time with the SAN management time option - Approximately once a day the management agent you are logged in to will set the controller's time to the time of the Management Appliance that is running that management agent.

4. Click **Set** to set the time (or click **Cancel** to cancel the set time procedure and return to the **System Options** page).

   A status page displays.

5. Click **OK** to return to the **Initialized Storage System Properties** page.

Event Parse File

The event parse file is loaded into the Management Appliance where the storage system software update occurred. This file associates an event code with an event condition and provides the descriptive text the management agent displays.

There is a unique version of the parse file for each version of the storage system software. Every management agent must have a copy of the parse file for the storage system it controls or monitors. The parse file resides on the Management Appliance. If the management agent is not the agent through which a storage system software update occurred, it can upload the parse file from the management agent through which the software update occurred.

Event Information Packet Type

The Event Information Packet (EIP) of a storage system event determines the template used to describe the detailed variables of a storage system event. The storage system event parse file is uploaded to the Management Appliance during a superfile image upload.

Table 4–8 explains event information packet codes.

Table 4–8: Event Information Packet (EIP) Type

Code	Event
0	Fault manager termination event. Controller operation was terminated due to an unrecoverable event detected by either software or hardware, or due to an action initiated via the storage system management interface.
1	Fault manager termination processing recursive entry event. A machine check occurred while a termination event was being processed.
2	Fault manager termination processing unexpected event. An unexpected event occurred while a termination event was being processed.
3	Fault manager management event. An event that affects fault manager operation occurred.
4	Fibre Channel services physical disk drive error. An error was encountered while attempting to access a physical disk drive.
5	Storage system management interface entity state change. The state of a storage system management entity has changed.
6	Fibre Channel services host Fibre Channel port state change. The state of a host Fibre Channel port has changed.

Table 4–8: Event Information Packet (EIP) Type (Continued)

Code	Event
7	Fibre Channel Services Fibre Channel port link error report. Excessive link errors detected.
A	Storage system services state change. A storage system state change occurred.
B	Storage system state services physical disk drive state change. A physical disk drive state change occurred.
D	Executive services system time change. A change in system time occurred.
E	Storage system management interface entity creation or deletion. A storage system management entity was created or deleted.
F	Storage system management interface entity attribute change. An attribute of a storage system management interface entity has changed.
10	System services controller state change. A controller state change occurred.
11	Storage system management interface event additional information. This is additional information related to an event previously reported by the storage system management interface component.

Setting System Operational Policies

Setting system operational policies governs the device addition policy. It determines if newly added physical disk drives are automatically added to a disk group. Two modes exist:

- Automatic (Intrinsic) – Allows the storage system to incorporate newly added physical disks into a disk group, as required, without user intervention. The disk group used is the one with the highest percentage occupancy.
- Manual (Extrinsic) – Requires user action for the storage system to incorporate newly added physical disks. This is the default.

To set the system operational policies:

1. Navigate to the **System Options** page by clicking **Options** on the **Initialized Storage System Properties** page (see Figure 4–6).

   NOTE: Chapter 3 provides getting started instructions which include navigating to the Management Agent Options page.

2. Click **Set System Operational Policies**.

   The **Set System Operational Policies** page displays (see Figure 4–8).

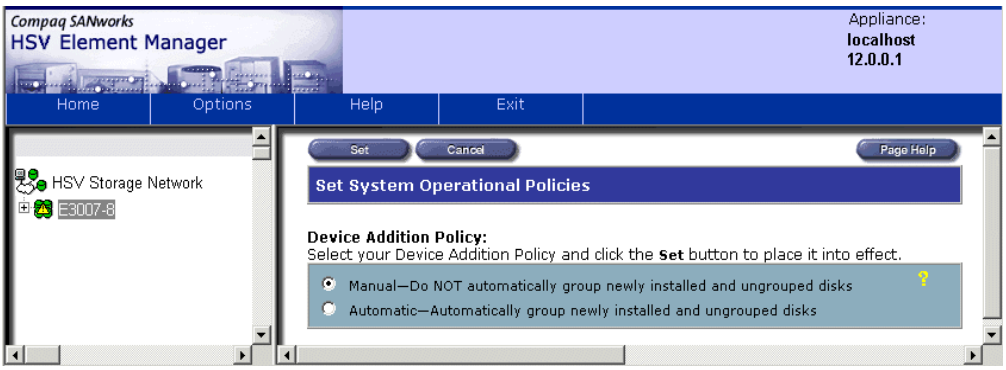


Figure 4–8: Set System Operational Policies page

3. Select one of the **Device Addition Policy** options.
4. Click **Set** or click **Cancel** to cancel the selection.

   A status page displays.
5. Click **OK**.

   The **System Options** page displays.

Event Notification File

Each storage system contains a configurable event notification file. You can specify the events or types of events that the management agent will report to the SNMP-enabled host. The event notification file controls event reporting only for the storage system where it resides.

Configuring an Event Notification File

To configure an event notification file:

1. Select a storage system in the **Navigation** pane.
   The **Initialized Storage System Properties** page displays (see Figure 4–9).

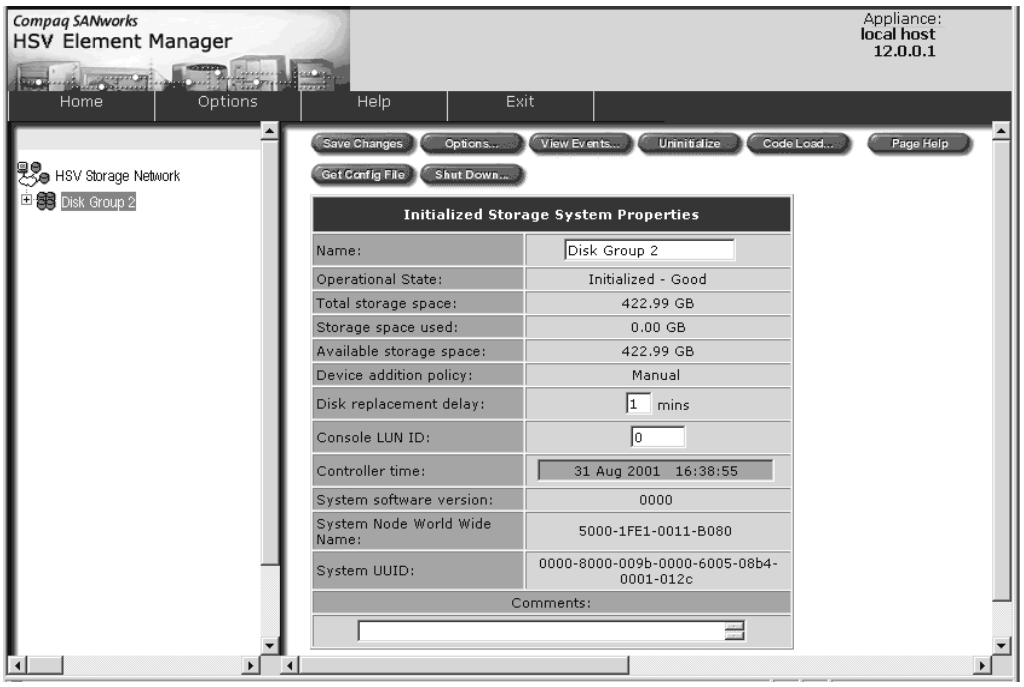


Figure 4–9: Initialized Storage System Properties page

2. Click **Options**.

   The **System Options** page displays (see Figure 4–6).

3. On the **System Options** page, click **Set** Event Notification: System Options.

   The **Set Event Notification Options** page displays (see Figure 4–10).

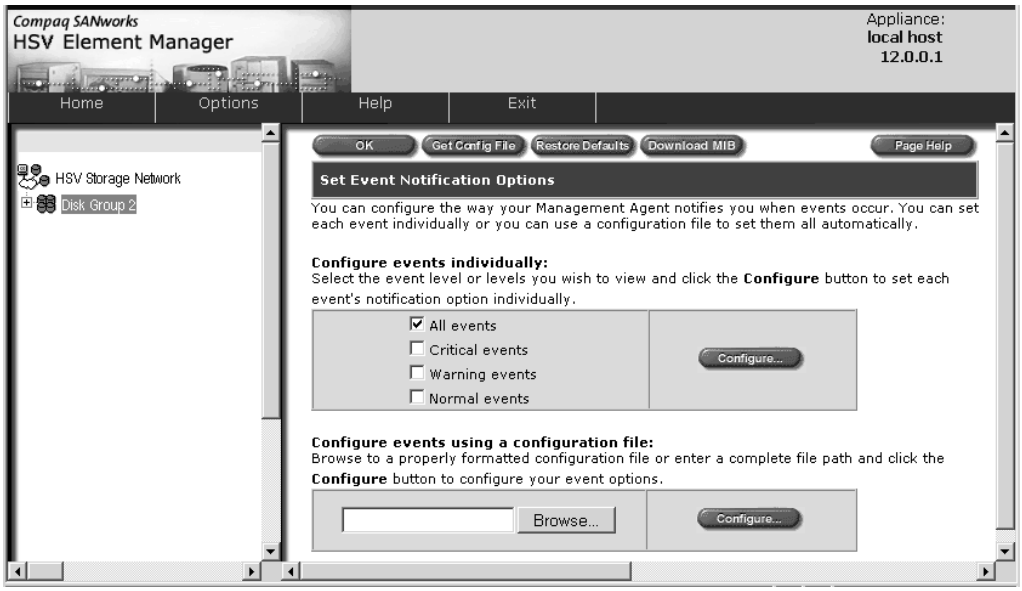


Figure 4–10: Set Event Notifications Options page

4. Follow the instructions to choose between configuration options:
   - Configure events individually.
   - Configure events using a configuration file.
5. Make changes.
6. Click **OK**.

Other options:

- **Restore Default**s – Restores the default state of the event notification file on this storage system.
- **Get Config File** – Allows downloading a file to configure events automatically.
- **Download MIB** - Allows you to display the MIB file or save it to the system where the browser is running.

Configure Events Individually

Configuring events individually allows you to specify the type of events the management agent will report to the SNMP-enabled hosts.

To configure events individually:

1. From the **Set Event Notifications Options** page, select one of the following options:

   IMPORTANT: Selecting the **All Events** option allows configuration of all events, which is important if you want SNMP traps set for storage system events.

   - **Critical** – Could likely prevent further operation of the management agent and the storage system.
   - **Warning** – Could stop operations of the management agent and the storage system without attention.
   - **Normal** – Occurs within normal operational parameters of the management agent and the storage system.

2. Click **Configure**. The **Set Event Options Individually** page displays (see Figure 4–11).

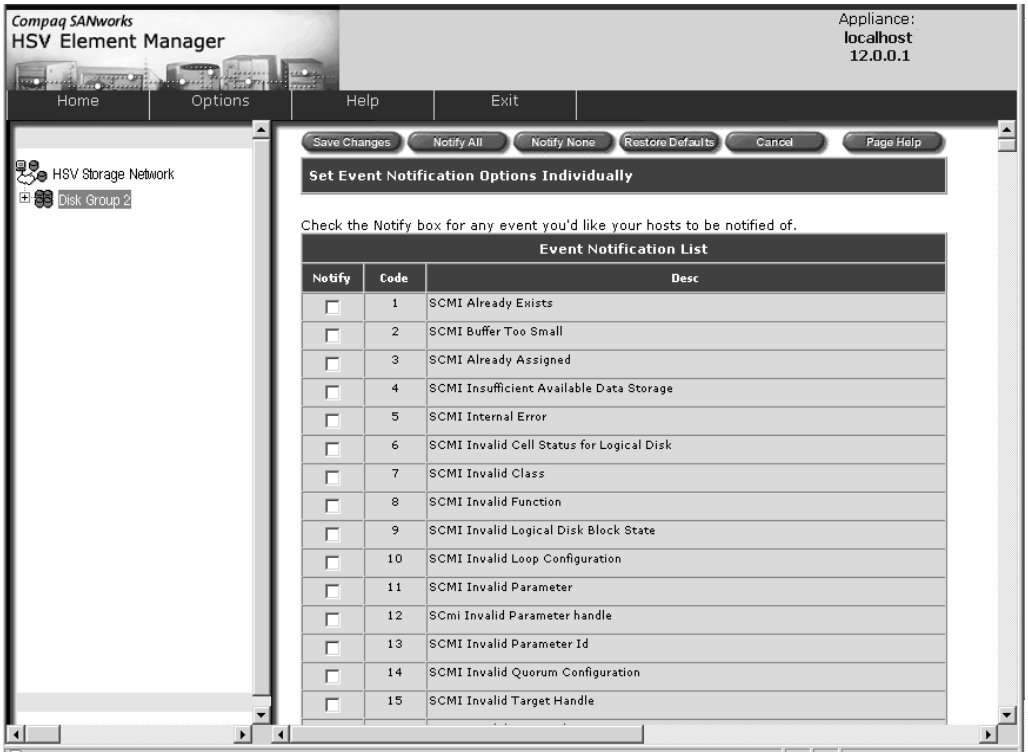


Figure 4–11: Set Event Options Individually page

3. Edit the list by checking or unchecking the notify column for each event.

   NOTE: A check indicates that qualified SNMP-enabled hosts will be notified if this event occurs.

4. Click **Save Changes** to save the changes to the event notification files or click on one of the following options:

   - **Notify All** – Reports all events to qualified SNMP-enabled hosts.
   - **Notify None** – Reports no events.
   - **Restore Defaults** – Sets the entire event notification file to the default state.
   - **Cancel** – Cancels any changes that have not yet been saved.

Configuring Events Using a Configuration File

To configure events, you can use a configured event notification file from another storage system and saved on the computer running the same browser.

IMPORTANT: If you use a configuration file saved from another storage system, it MUST be the same version of VCS controller software.

To configure events using a previously configured event notification file:

1. From the **Set Event Notifications Options** page (see Figure 4–10), browse to the configuration file using the Browse option under **Configure events using a configuration file.**
2. Click **Configure** to use that configuration file to configure events.

Copying an Event Notification file to Another Storage System

To copy a previously configured event notification file to another storage system:

1. Select a storage system in the **Navigation** pane.
2. On the **Initialized Storage System Properties** page, click **Options**.

   The **System Options** page displays.
3. On the **System Options** page, click **Set** for Event Notification: System Options.

   The **Set Event Notification Options** page displays.
4. Click the **Get Config File** button.

   A **File Download** screen displays allowing you to retrieve the event notification file from the storage system and put it on your local system (the computer on which the browser is running).

IMPORTANT: The storage system **from** which the file is copied and the storage system **to** which the file is copied must be running the same version of controller software. The main property page for a storage system displays its software (AKA firmware) version.

To use the copied event notification file on another storage system:

1. Select the storage system you want to receive the copied file.
2. On the **Initialized Storage System Properties** page, click **Options**.

   The **System Options** page displays.
3. On the **System Options** page, click **Set** for the Event Notification: System Options to display the **Set Event Notification Options** page.
4. Browse to the copied file and click **Configure**.

Host Notification File

Each storage system contains a configurable host notification file that specifies which SNMP-enabled host will receive SNMP traps on events that have been configured (see Figure 4–11) for notification. The host notification file controls reporting only for the storage system where it resides.

An SNMP-enabled host is a computer designated to be a collection point for the SNMP traps the management agent generates to record events. Any computer on the same network as the storage system can be SNMP-enabled with the correct software.

Configuring a host notification file can be done directly by modifying the list or by using a previously configured host notification file.

Configuring a Host Notification File

To configure a host notification file:

1. Navigate to the storage system on which you want to configure the file.
2. On the I**nitialized Storage System Properties** page, click **Options**.

   The **System Options** page displays (see Figure 4–6).

3. On the **System Options** page, click **Set** for Event Notification: Host Options. The **Set Event Host Options** page displays (see Figure 4–12).

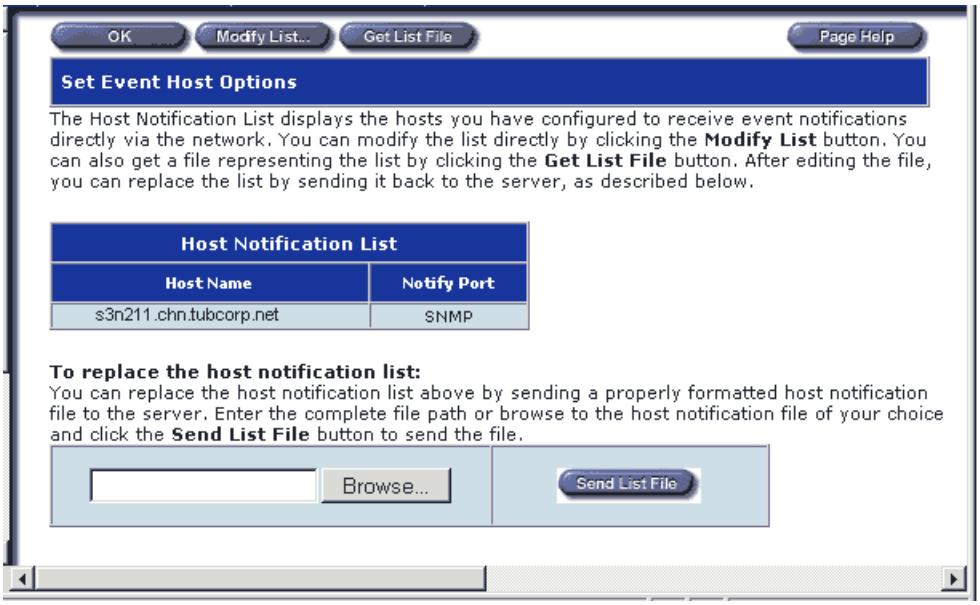


Figure 4–12: Set Event Host Options page

4. Follow the instructions on the page to choose configuration options.
5. Make changes.
6. Click **OK**.

Copying the Host Notification File to Another Storage System

To copy a previously configured host notification file to another storage system:

1. Navigate to the storage system that contains the host notification file that you want to copy.
2. On the **Initialized Storage System Properties** page, click **Options**.

   The **System Options** page displays (see Figure 4–6).
3. On the **System Options** page, click **Set** for Event Notification: Host Options.

   The **Set Event Host Options** page displays (see Figure 4–12).
4. Click **Get List File** to retrieve the host notification file from the storage system to put it on your local system (the computer on which the browser is running).

NOTE: A host notification files is not dependent on the VCS version. You can download a host notification file from one storage system and load it onto another, even though it is running a different VCS version.

CAUTION: An uploaded host notification file will overwrite any previous configured hosts on a storage system.

To use the copied host notification file on another storage system:

1. Navigate to the storage system that you want to receive the copied file.
2. On the **Initialized Storage System Properties** page, click **Options**.

   The **System Options** page displays.
3. On the **System Options** page, click **Set** for the Host Notification: System Options.

   The **Set Host Notification Options** page displays.
4. Browse to the copied file and click **Configure**.

Changing the Host Notification List

The Host Notification List displays the SNMP-enabled hosts you have configured to receive event notifications directly via the network. You can modify, add to, or delete from this list.

Modifying the Host Notification List

You can modify the Host Notification List by editing any of its entries. To modify the Host Notification list, perform the following steps.

CAUTION: If you edit an existing Host Name entry and specify a blank entry, the associated SNMP-enabled host will be deleted from the host notification file.

1. Click **Options** on the **Initialized Storage System Properties** page.
2. Click **Set** for Event Notification: Host Options.
   The **Set Event Host Options** page displays.
3. Click **Modify List**.

   The **Modify Host Notification List** page displays (see Figure 4–13).

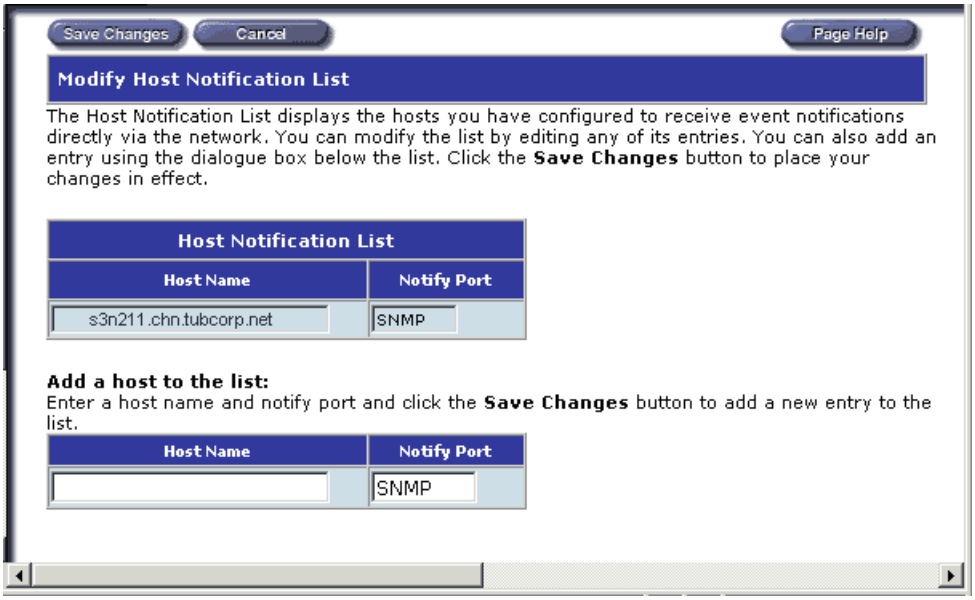


Figure 4–13: Modify Host Notification List

4. Make modifications in the fields on the **Host Notification List**.
5. Click **Save Changes**. The Set **Host Notification** page displays showing changes.

Adding an Entry to the Host Notification List

To add an entry:

1. On the **Modify Host Notification List** page, enter a fully-qualified network name for the SNMP-enabled host computer in the **Add a host to the list Host Name** field. Example: `SNMPtrap.companyname.com`.
2. Enter the notification port.

   The SNMP port is the default, but this can be changed if an application requires another port.
3. Click **Save Changes** button.

   The **Set Event Host** page displays showing the changes.

Deleting an Entry from the Host Notification List

To delete an entry:

1. On the **Modify Host Notification List** page, highlight the host name on the Host Notification List.
2. Delete the host name.
3. Click **Save Changes**.

Glossary

This glossary defines terms used in this guide or related to the HSV Element Manager for Enterprise Virtual Array and is not a comprehensive glossary of computer terms.

active virtual disk
A virtual disk family can contain multiple members. The Active member is the primary data container for the family.

See also **virtual disk, virtual disk copy, virtual disk family,** *and* **snapshot.**

adapter
See **controller.**

allocation policy
Storage system rules that govern how virtual disk snapshots are created. Allocate Completely and Allocate on Demand are the two rules used in creating virtual disks.

- Allocate Completely—The space a virtual disk requires on the physical disks is reserved, even if the virtual disk is not currently using the space.
- Allocate on Demand—The space a virtual disk requires on the physical disks is not reserved until needed.

arbitrated loop
A Fibre Channel topology that links multiple ports (up to 126) together on a single shared simplex media. Transmissions can only occur between a single pair of nodes at any given time. Arbitration is the scheme that determines which node has control of the loop at any given moment.

arbitrated loop topology
See **arbitrated loop.**

array
All the physical disk drives in a storage system that are known to and under the control of a controller pair.

array controller
See **controller.**

audible alarm
The environmental monitoring unit (EMU) alarm that sounds when there is a disk drive enclosure element condition report. The audible alarm can be muted.

bad block
A data block on a disk drive that contains a physical defect.

bad block replacement
A replacement routine that substitutes defect-free disk blocks for those found to have defects. This process takes place in the controller and is transparent to the host.

bay
The physical location of an element, such as a drive, I/O module, EMU or power supply in a drive enclosure. Each bay is numbered to define its location.

block
Also called a sector. The smallest collection of consecutive bytes addressable on a disk drive. In integrated storage elements, a block contains 512 bytes of data, error codes, flags, and the block address header.

CAC
Corrective Action Code. A code that defines the action required to correct a problem.

cache
High-speed memory that sets aside data as an intermediate data buffer between a host and the storage media. The purpose of cache is to improve performance.

See also **read cache, write cache,** *and* **mirrored cache.**

client
A software program that uses the services of another software program. The HSV Element Manager client is a standard internet browser.

communication logical unit number (LUN)
See **console LUN.**

Compaq SANWorks HSV Element Manager
See **HSV Element Manager.**

Compaq StorageWorks
The Compaq trademarked name used to describe the set of rack-mounted enclosures containing controllers, transceivers, I/O modules, EMUs, disk drives, cables, blowers, and power supplies used to design and configure a solution-specific storage system.

condition report
A three-element code generated by the EMU in the form where *e.t.* is the element type (a hexadecimal number), *en.* is the element number (a decimal number), and *ec* is the condition code (a decimal number).

console LUN
A SCSI-3 virtual object that makes a controller pair accessible by the host before any virtual disks are created. Also called a communication LUN.

console LUN ID
The ID that can be assigned when a host operating system requires a unique ID. The console LUN ID is assigned by the user, usually when the storage system is initialized.

See also **console LUN.**

controller
A hardware/firmware device that manages communications between host systems and other devices. Controllers typically differ by the type of interface to the host and provide functions beyond those the hosts support separately.

controller event
A significant occurrence involving any storage system hardware or software component reported by the controller to the HSV Element Manager.

controller pair
Two interconnected controller modules which together control a physical disk array. A controller pair and the disk array together constitute a storage system.

corrective action code
See **CAC.**

CRITICAL Condition
A disk drive enclosure EMU condition that occurs when one or more disk drive enclosure elements have failed or are operating outside of their specifications. The failure of the element makes continued normal operation of at least some elements in the enclosure impossible. Some enclosure elements may be able to continue normal operations. Only an UNRECOVERABLE condition has precedence. This condition has precedence over NONCRITICAL errors and INFORMATION condition.

default disk group
The first disk group created at the time the system in initialized. The default disk group can contain the entire set of physical disks in the array or just a few of the disks.

See also **disk group.**

device channel
A channel used to connect storage devices to a host I/O bus adapter or intelligent controller.

disk drive
A carrier-mounted storage device supporting random access to fixed size blocks of data.

disk drive blank
A carrier that replaces a disk drive to control airflow within a drive enclosure whenever there is less than a full complement of storage devices.

disk drive enclosure
A unit that holds storage system devices such as disk drives, power supplies, blowers, I/O modules, transceivers or EMUs.

disk drive enclosure event
A significant operational occurrence involving a hardware or software component in the disk drive enclosure. The disk drive enclosure EMU reports these events to the controller for processing.

disk failure protection
A method by which a controller pair reserves drive capacity to take over the functionality of a failed or failing physical disk. For each disk group, the controllers reserve space in the physical disk pool equivalent to the selected number of physical disk drives.

disk group
A physical disk drive set or pool in which a virtual disk is created. A disk group may contain all the physical disk drives in a controller pair array or a subset of the array.

disk migration state
A physical disk drive operating state. A physical disk drive can be in a stable or migration state:

- Stable – The state in which the physical disk drive's data is not changing because of an existing or impending failure.
- Migration – The state in which the disk drive is failing, or failure is predicted to be imminent. Data is then moved off the disk onto other disk drives in the same disk group.

disk replacement delay
The time that elapses between a drive failure and when the controller starts searching for spare disk space. Drive replacement seldom starts immediately in case the "failure" was a glitch or temporary condition.

drive blank
See **disk drive blank.**

dual-loop
A configuration where each drive is connected to a pair of controllers through two loops. These two Fibre Channel loops constitute a loop pair.

dual power supply configuration
See **redundant power configuration.**

EIP
Event Information Packet. The event information packet is an HSV element hexadecimal number that groups controller events into specific types.

Also called the EIP type.

element

- In a disk drive enclosure, a device such as an EMU, power supply, disk, blower, or I/O module. The object can be controlled, interrogated, or described by the enclosure services process.
- In the Compaq Open SAN Manager, a controllable object, such as the Compaq StorageWorks Enterprise Storage System.

Element Manager GUI
The graphical user interface (GUI) through which a user can control and monitor a storage system. The HSV Element Manager software can be installed on more than one management appliance in a fabric. Each installation of the HSV Element Manager software is a management agent. The client for the agent is a standard browser.

EMU
Environmental Monitoring Unit. An element which monitors the status of an enclosure, including the power, air temperature, and blower status. The EMU detects problems and displays and reports these conditions to a user and the controller. In some cases, the EMU implements corrective action.

enclosure
A unit used to hold various storage system devices such as disk drives, controllers, power supplies, blowers, an EMU, I/O modules, or blowers.

Enterprise Virtual Array
The Compaq name used to describe the storage system that includes HSV controllers, storage devices, enclosures, cables, and power supplies. *Also* called the Enterprise Storage System.

Enterprise Virtual Array rack
A unit that holds controller enclosures, disk drive enclosures, power distribution supplies, and enclosure address buses that, combined, comprise an Enterprise Storage System solution. *Also* called the Enterprise Storage System rack.

See also **rack.**

environmental monitoring unit
See **EMU.**

error code
The portion of an EMU condition report that uniquely identifies a problem.

event
Any significant change in the state of the Enterprise Storage System hardware or software component reported by the controller to the HSV Element Manager.

See also **controller event, disk drive enclosure event, management agent event,** *and* **termination event.**

Event Information Packet
See **EIP.**

Event Number
See **Evt No.**

Evt No.
Event Number. An integer in the range 0-255, that when combined with the Software Component ID (SWC ID) uniquely identifies a controller event.

failover
The process that takes place when one controller assumes the workload of a failed companion controller. Failover continues until the failed controller is operational.

Fault Management Code
See **FMC.**

FC HBA
Fibre Channel Host Bus Adapter. An interchangeable term for Fibre Channel adapter.

See also **FCA.**

FCA
Fiber Channel Adapter. An adapter used to connect the host server to the fabric. *Also* called a Host Bus Adapter (HBA) or a Fibre Channel Host Bus Adapter (FC HBA).

See also **FC HBA**

FCP
Fibre Channel Protocol. The mapping of SCSI-3 operations to Fibre Channel.

fiber
The optical media used to implement Fibre Channel.

fiber optics
The technology where light is transmitted through glass or plastic (optical) threads (fibers) for data communication or signaling purposes.

fiber optic cable
A transmission medium designed to transmit digital signals in the form of pulses of light. Fiber optic cable is noted for its properties of electrical isolation and resistance to electrostatic contamination.

fibre
The international spelling that refers to the Fibre Channel standards for optical media.

Fibre Channel
A data transfer architecture designed for mass storage devices and other peripheral devices that require very high bandwidth.

Fibre Channel adapter
See **FCA.**

field replaceable unit
See **FRU.**

FMC
Fault Management Code. The HSV Element Manager display of the Enterprise Storage System error condition information.

frequency
The number of cycles that occur in one second expressed in Hertz (Hz). Thus, 1 Hz is equivalent to one cycle per second.

Gb
Gigabit. A measurement of the rate at which the transfer of bits of data occurs. Sometimes referred to as Gbps. Nominally, a Gb is a transfer rate of 1,000,000,000 (10^9) bits per second.

For Fibre Channel transceivers or FC loops the Gb transfer rates are:

- 1 Gb is a transmission rate of 1,062,500,000 bits per second.
- 2 Gb is a transmission rate of 2,125,000,000 bits per second.

GB
Gigabyte. A unit of measurement defining either:

- A data transfer rate.

  See also **GBps**

- A storage or memory capacity of 1,073,741,824 (2^{30}) bytes.

GBIC
Gigabit Interface Converter.

See **transceiver.**

Gbps
Gigabits per second. A measurement of the rate at which the transfer of bits of data occurs. Nominally, a Gb is a transfer rate of 1,000,000,000 (10^9) bits per second.

See also **Gb.**

GBps
Gigabytes per second. A measurement of the rate at which the transfer of bytes of data occurs. A GBps is a transfer rate of 1,000,000,000 (10^9) bits per second.

See also **GB.**

Giga (G)
The notation to represent 10^9 or 1 billion (1,000,000,000).

gigabit
See **Gb.**

gigabit per second
See **Gbps.**

graphical user interface
See **GUI.**

GUI
Graphical User Interface. Software that displays the status of a storage system and allows its user to control the storage system.

HBA
Host Bus Adapter.

See **FCA.**

host
A computer that runs user applications and uses (or can potentially use) one or more virtual disks created and presented by the controller pair.

Host Bus Adapter
See **FCA.**

host computer
See **host.**

HSV Element Manager
See **Element Manager.**

hub
A communications infrastructure device to which nodes on a multi-point bus or loop are physically connected. It is used to improve the manageability of physical cables.

I/O module
Input/Output module. The enclosure element that is the FC-AL interface to the host or controller. I/O modules are bus speed specific; either 1 Gb or 2 Gb.

IDX
A 2-digit decimal number portion of the HSV controller termination code display that defines one of 32 locations in the Termination Code array that contains information about a specific event.

See also **param** and **TC.**

in-band communication
The method of communication between the EMU and controller that utilizes the FC-AL bus.

See also **out-of-band communication.**

INFORMATION condition
A disk drive enclosure EMU condition report that may require action. This condition is for information only and does not indicate the failure of an element. All condition reports have precedence over an INFORMATION condition.

initialization
A process that prepares a storage system for use. Specifically, the system binds controllers together as an operational pair and establishes preliminary data structures on the disk array. Initialization also sets up the first disk group, called the default disk group.

input/output module
See **I/O module.**

interface
A set of protocols used between components such as cables, connectors, and signal levels.

K
Kilo. A scientific notation denoting a multiplier of one thousand (1,000).

KB
Kilobyte. A unit of measurement defining either storage or memory capacity.

- For storage, a KB is a capacity of 1,000 (10^3) bytes of data.
- For memory, a KB is a capacity of 1,024 (2^{10}) bytes of data.

Last Fault View
An HSV Controller display defining the last reported fault condition.

Last Termination Error Array
See **LTEA.**

link
A connection between ports on Fibre Channel devices. The link is a full duplex connection to a fabric or a simplex connection between loop devices.

logon
Also called login, it is a procedure whereby a user or network connection is identified as being an authorized network user or participant.

loop
See **arbitrated loop.**

loop pair
A Fibre Channel attachment between a controller and physical disk drives. Physical disk drives connect to controllers through paired Fibre Channel arbitrated loops. There are two loop pairs, designated loop pair 1 and loop pair 2. Each loop pair consists of two loops (called loop A and loop B) that operate independently during normal operation, but provide mutual backup in case one loop fails.

LTEA
Last Termination Event Array. A two-digit HSV Controller number that identifies a specific event that terminated an operation. Valid numbers range from 00 to 31.

LUN
Logical Unit Number. A SCSI convention used to identify addressable elements. The host sees a virtual disk as a LUN. The LUN address a user assigns to a virtual disk for a particular host will be the LUN at which that host will see the virtual disk.

management agent
The HSV Element Manager software that controls and monitors the Enterprise Storage System. The software can exist on more than one management appliance in a fabric. Each installation of the HSV Element Manager software is a management agent.

management agent event
A significant occurrence to or within the management agent software, or an initialized storage cell controlled or monitored by the management agent.

Mb
Megabit. A term defining a data transfer rate.

See also **Mbps.**

MB
Megabtye. A term defining either:

- A data transfer rate.

  See also **MBps.**

- A measure of either storage or memory capacity of 1,048,576 (2^{20}) bytes.

Mbps
Megabits per second. A measure of bandwidth or data transfers occurring at a rate of 1,000,000 (10^6) bits per second.

MBps
Megabytes per second. A measure of bandwidth or data transfers occurring at a rate of 1,000,000 (10^6) bytes per second.

mean time between failures
See **MTBF.**

Mega
A notation denoting a multiplier of 1 million (1,000,000).

metadata
Information that a controller pair writes on the disk array. This information is used to control and monitor the array and is not readable by the host.

mirrored caching
A process in which half of each controller's write cache mirrors the companion controller's write cache. The total memory available for cached write data is reduced by half, but the level of protection is greater.

mirroring
The act of creating an exact copy or image of data.

multi-mode fiber
A fiber optic cable with a diameter large enough (50 microns or more) to allow multiple streams of light to travel different paths from the transmitter to the receiver. This transmission mode enables bidirectional transmissions.

Network Storage Controller
See **NSC.**

NONCRITICAL Condition
A disk drive enclosure EMU condition report that occurs when one or more elements inside the enclosure have failed or are operating outside of their specifications. The failure does not affect continued normal operation of the enclosure. All devices in the enclosure continue to operate according to their specifications. The ability of the devices to operate correctly may be reduced if additional failures occur. UNRECOVERABLE and CRITICAL errors have precedence over this condition. This condition has precedence over INFORMATION condition. Early correction can prevent the loss of data.

node port
A device port that can operate on the arbitrated loop topology.

non-OFC (Open Fibre Control)
A laser transceiver whose lower-intensity output does not require special open Fibre Channel mechanisms for eye protection. The Enterprise Storage System transceivers are non-OFC compatible.

NSC
Network Storage Controller. The HSV Controllers used by the Enterprise Storage System.

NVRAM
Nonvolatile Random Access Memory. Memory whose contents are not lost when a system is turned off or if there is a power failure. This is achieved through the use of UPS batteries or implementation technology such as flash memory. NVRAM is commonly used to store important configuration parameters.

occupancy alarm level
A percentage of the total disk group capacity in blocks. When the number of blocks in the disk group that contain user data reaches this level, an event code is generated. The alarm level is specified by the user.

OCP
Operator Control Panel. The element that displays the controller's status using LEDs and an LCD. Information selection and data entry is controlled by the OCP push buttons.

operator control panel
See **OCP.**

OSM
Open SAN Manager. A centralized, appliance-based monitoring and management interface that supports multiple applications, operating systems, hardware platforms, storage systems, tape libraries and SAN-related interconnect devices. It is included and resides on the SANWorks Management Appliance, a single aggregation point for data management.

out-of-band communication
Communication between an enclosure and reporting group elements that does not use the FC-AL bus, such as the enclosure address bus. Any communication that does not occur within the data path.

See also **in-band communication.**

param
That portion of the HSV controller termination code display that defines:

- The 2-character parameter identifier that is a decimal number in the 0 through 30 range.
- The 8-character parameter code that is a hexadecimal number.

See also **IDX** and **TC.**

parity check
A method of detecting errors when data is sent over a communications line. With even parity, the number of ONE bits in a set of binary data should be even. With odd parity, the number of ONE bits should be odd.

password
A security interlock whose purpose is to allow:

- a management agent control only certain storage systems
- only certain management agents control a storage system

physical disk
A disk drive mounted in a disk drive enclosure that communicates with a controller pair through the device-side Fibre Channel loops. A physical disk is hardware with embedded software, as opposed to a virtual disk, which is constructed by the controllers. Only the controllers can communicate directly with the physical disks.

The physical disks, in aggregate, are called the array and constitute the storage pool from which the controllers create virtual disks.

physical disk array
See **array**.

port
A Fibre Channel connector on a Fibre Channel device.

port_name
A 64-bit unique identifier assigned to each Fibre Channel port. The port_name is communicated during the login and port discovery processes.

power supply
An element that develops DC voltages for operating the storage system elements from either an AC or DC source.

preferred address
An AL_PA which a node port attempts to acquire during loop initialization.

preferred path
A preference for which controller of the controller pair manages a virtual disk. This preference is set by the user through the element manager when creating the virtual disk. A host can change the preferred path of a virtual disk at any time. The primary purpose of preferring a path is load balancing.

protocol
The conventions or rules for the format and timing of messages sent and received.

read caching
A cache method used to decrease subsystem response times to a read request by allowing the controller to satisfy the request from the cache memory rather than from the disk drives. Reading data from cache memory is faster than reading data from a disk. The read cache is specified as either on or off for each virtual disk. The default state is on.

read ahead caching
A cache management method used to decrease the subsystem response time to a read request by allowing the controller to satisfy the request from the cache memory rather than from the disk drives.

redundancy

- Element Redundancy—The degree to which logical or physical elements are protected by having another element that can take over in case of failure. For example, each loop of a device-side loop pair normally work independently but can take over for the other in case of failure.
- Data Redundancy—The level to which user data is protected. Redundancy is directly proportional to cost in terms of storage usage; the greater the level of data protection, the more storage space is required.

redundant power configuration
A capability of the Enterprise Storage System racks and enclosures to allow continuous system operation by preventing single points of power failure.

- For a rack, two AC power sources and two power conditioning units distribute primary and redundant AC power to enclosure power supplies.
- For a controller or disk drive enclosure, two power supplies ensure that the DC power is available even when there is a failure of one supply, one AC source, or one power conditioning unit. Implementing the redundant power configuration provides protection against the loss or corruption of data.

reporting group
An Enterprise Storage System controller pair and the associated disk drive enclosures. The Enterprise Storage System controller assigns a unique decimal reporting group number to each EMU on its loops. Each EMU collects disk drive environmental information from its own sub-enclosure and broadcasts the data over the enclosure address bus to all members of the reporting group. Information from enclosures in other reporting groups is ignored.

selective presentation
The process whereby a controller presents a virtual disk only to the host computers authorized access.

snapclone
A clone or exact replica of another virtual disk at a particular point in time. Only an active virtual disk can be copied. A copy immediately becomes the active disk of its own virtual disk family

snapshot
A temporary virtual disk (VD) that reflects the contents of another virtual disk at a particular point in time. A snapshot operation is only done on an active virtual disk. Only one snapshot of an active virtual disk can exist at any point. The active disk and its snapshot constitute a virtual family.

See also **active virtual disk, virtual disk copy,** *and* **virtual disk family.**

SSN
Storage System Name. An HSV Element Manager-assigned, unique 20-character name that identifies a specific storage system.

storage carrier
See **carrier.**

storage pool
The aggregated blocks of available storage in the total physical disk array.

storage system
The controllers, storage devices, enclosures, cables, and power supplies and their software.

Storage System Name
See **SSN.**

SWC ID
Software Component ID. An integer value in the range 0-255 which identifies the VCS software component reporting a controller event.

TB
Terabyte. A term defining either:

- A data transfer rate.

  See also **TBps.**

- A measure of either storage or memory capacity of 1,099,5111,627,776 (2^{40}) bytes.

TBps
Terabytes per second. A data transfer rate of 1,000,000,000,000 (10^{12}) bytes per second.

TC
Termination Code. An Enterprise Storage System controller 8-character hexadecimal display that defines a problem causing controller operations to halt.

See also **IDX** and **param.**

Termination Code
See **TC.**

termination event
Occurrences that cause the storage system to cease operation.

terminator
Interconnected elements that form the ends of the transmission lines in the enclosure address bus.

topology
An interconnection scheme that allows multiple Fibre Channel ports to communicate. Point-to-point, arbitrated loop, and switched fabric are all Fibre Channel topologies.

transceiver
The device that converts electrical signals to optical signals at the point where the fiber cables connect to the FC elements such as hubs, controllers, or adapters. *Also* called a Gigabit Interface Converter (GBIC).

uninitialized system
A state in which the storage system is not ready for use because the logical structures that bind the hardware into a system have not been created within it.

See also **initialization.**

UNRECOVERABLE Condition
A disk drive enclosure EMU condition report that occurs when one or more elements inside the enclosure have failed and have disabled the enclosure. The enclosure may be incapable of recovering or bypassing the failure and will require repairs to correct the condition.

This is the highest level condition and has precedence over all other errors and requires immediate corrective action.

unwritten cached data
Also called unflushed data.

See also **dirty data.**

VD
Virtual Disk. A virtual disk drive created by the controllers as storage for one or more hosts. The virtual disk characteristics, chosen by the storage administrator, provide a specific combination of capacity, availability, performance, and accessibility.

The host computer sees the virtual disk as "real," with the characteristics of an identical physical disk.

See also **active virtual disk, virtual disk copy, virtual disk family,** *and* **virtual disk snapshot**

virtual disk
See **VD.**

virtual disk copy
See snapclone.

See also **active virtual disk, virtual disk family,** *and* **virtual disk snapshot**

virtual disk family
A virtual disk and its snapshot, if a snapshot exists, constitute a family. The original virtual disk is called the active disk. When you first create a virtual disk family, the only member is the active disk.

See also **active virtual disk, virtual disk copy,** *and* **virtual disk snapshot.**

virtual disk snapshot
See **snapshot.**

Vraid0
A virtualization technique that provides no data protection. Host data is broken down into chunks and distributed on the disks comprising the disk group from which the virtual disk was created. Reading and writing to a Vraid0 virtual disk is very fast and makes the fullest use of the available storage, but there is no data protection (redundancy) unless there is parity.

Vraid1
A virtualization technique that provides the highest level of data protection. All data blocks are mirrored on separate physical disks. For read requests, the block can be read from either disk, which can increase performance. Mirroring takes the most storage space because at least twice the storage capacity must be allocated for a given amount of data.

Vraid5
A virtualization technique that uses parity striping to provide moderate data protection. Parity is a data protection mechanism for a striped virtual disk. A striped virtual disk is one whose data to and from the host is broken down into chunks and distributed across the disk group in which the virtual disk was created. If one of the data chunks becomes corrupted, the data can be reconstructed from the parity chunk and the remaining data chunks.

World Wide Name
See **WWN.**

write back caching
A controller process that notifies the host that the write operation is complete when the data is written to the cache. This occurs before transferring the data to the disk. Write back caching improves response time since the write operation completes as soon as the data reaches the cache. As soon as possible after caching the data, the controller then writes the data to the disk drives.

write caching
A process when the host sends a write request to the controller, and the controller places the data in the controller cache module. As soon as possible, the controller transfers the data to the physical disk drives.

WWN
World Wide Name. A unique Fibre Channel identifier consisting of a 16-character hexadecimal number. A WWN is required for each Fibre Channel communication port.

Index

A

advanced options
  for snapclone 3–37 to 3-42
  forsnapshot 3–29 to 3–31
allocation policy
  for snapshot 3–29
applications names, convention defined x
audience ix
authorized reseller, Compaq xiii

B

bordered tables 2–19
button names, convention defined x

C

caution, symbol and definition x
command names, convention defined x
comments 3–7, 3–16
Compaq
  authorized reseller xiii
  technical support xii
  website xiii
controller
  time 4–12
conventions
  application names, defined x
  button names, defined x
  command names, defined x
  dialog box names, defined x
  document x
  file names, defined x
  keyboard keys, defined x
  menu items, defined x
  menu sequences, defined x
  system responses, defined x
  user input, defined x
  variables x
  website addresses x

D

date and time options 2–25
dialog box names, convention defined x
disk 3–1
disk group
  adding 3–10
  advanced options 3–8 to 3–9
  creating 3–7 to 3–9
  deleting 3–11
  modifying 3–10 to 3–11
  total capacity 3–6
  unique name 3–2
  virtual disk family association 3–15
  working with 3–1 to 3–11
disk protection level 2–25
disks
  total assigned to disk groups 3–3
  total not assigned to groups 3–3
display refresh options
  setting 2–20 to 2-21
document
  conventions x
  prerequisites ix
documentation, related ix

E

EIP
  type 4–14
electrical shock hazard, symbol and definition xi

EMU
event logs 4–9
environmental monitoring unit. See EMU.
equipment symbols xi
event fields
storage system
spontaneous
CAC 4–3
EIP type 4–3
event information packet. See EIP.
event log
management agent 4–4
filtering 4–6 to 4–7
table headings 4–5
alarm 4–5
appliance 4–5
code 4–5
date and time 4–5
description 4–5
termination event
table headings 4–10
termination events 4–10
event notification file 4–16
configuring 4–16 to 4–21
copying
to another storage system 4–21
event parse file 4–14 to 4–16
event trap
management agent
fields 4–4
date and time 4–3
description 4–3
event code 4–3
host name 4–3
storage system name 4–3
event traps
disk enclosure 4–3
fields
date/time 4–3
element type 4–3
shelfID 4–3
storagecell name 4–3
storage system
spontaneous 4–2
events 4–1
configuring individually 4–19
disk enclosure 4–9
management agent 4–4
management agents
filtering parameters 4–7
SNMP trap 4–2
termination 4–9 to 4–10
viewing 4–1, 4–11
events controller 4–7 to 4–8
excessive weight, symbol and definition xi

F

FCA, Fibre Channel Adapter 3–43
Fibre Channel
port 3–43
Fibre Channel Adapter ports WWN 3–44
Fibre Channel Adapter. See FCA
Fibre Channel fabrics 1–5
file names, convention defined x

G

getting help xii
Compaq technical support xii
Compaq website xiii

H

help, obtaining xii
host
adding 3–46 to 3-48
deleting 3–48
properties 3–44
comments 3–45
HSV connections
active 3–45
IP address 3–44
modifying 3–48
name 3–44
operating system 3–44
operational state 3–44
total hosts 3–44

UID 3–44
Virtual Disk/LUN 3–45
host folder
properties
IP address 3–44
name 3–44
operational state 3–44
host notification file 4–22 to 4–26
adding an entry 4–25
configuring 4–22 to 4–23
copying 4–23 to 4–24
modifying 4–24 to 4–25
hosts
working with 3–43 to 3–48
hot surface, symbol and definition xi
HSV Element Manager 1–1, 1–5
features and capabilities 1–2
getting started 2–1 to 2–26
installing 2–1
launching 2–4 to 2–7
setting up. See management agent

I

important, defined x
informational text
entering 2–26
setting for session pane 2–20
initialization 2–21
advanced options
using 2–23 to 2–26
internet browser
supported 2–1
introduction
Management Appliance 1–1

K

keyboard keys, convention defined x

L

license key
adding 2–17, 2–18
entering 2–17
viewing 2–16
license keys
basic 2–15
snapshot 2–15
licensing options
accessing and viewing 2–16
loop pair 1 1–5
loop pair 2 1–5
LUN address
selecting for snapclone 3–38
LUN identification number 2–25

M

management agent
setting up 2-8 to 2-9
Management Appliance 1–5
time 4–12
menu
items, convention defined x
sequences, convention defined x
multiple power source, symbol and definition xi

N

name 3–15
Navigation pane 3–3
network interface connection, symbol and definition xi
note, defined x

O

occupancy 3–6
OS Unit ID
specifying for a snapshot 3–29
OSM 2–1
OSM Home page
navigating 2–2 to 2–3

P

page footer and message options
setting 2–20
password
changing for storage system 2–13 to 2–14
password protection
adding a storage system 2–11 to 2–13

deleting storage system 2–14 to 2–15
physical disk 3–2
physical disk array 1–5
port
adding 3–49 to 3–50
deleting 3–50 to 3–51
ports
working with 3–49 to 3–51
preferred presentation path 3–16
prerequisites ix

R

rack stability, warning xii
rediscovering 2–9
redundancy
snapshot property 3–24
refresh interval 2–21
related documentation ix

S

See WWN.
snapclone
advanced options
comments 3–41
setting write protection level 3–40
create 3–37
creating 3–36 to 3–42
advanced options 3–37 to 3–42
modifying 3–42 to 3–43
versus snapshot 3–36
snapshot 3–12
advanced options 3–29 to 3–31
comments 3–31
creating 3–27 to 3–29
deleting 3–32
disk group association 3–23
properties
modifying 3–31
viritual disk
OS Unit ID 3–26
virtual disk
adaptive read caching 3–25
allocation 3–23
cache memory 3–25
capacity used 3–23
comments 3–27
created (date/time) 3–25
level of protection 3–24
mirror write-back mode 3–24
normal read ahead caching 3–25
normal read caching 3–25
operational state 3–25
preferred path 3–26
read-cache policy 3–25
redundancy 3–24
unmirrored write-back mode 3–24
write protect 3–25
write-cache policy 3–24
write-through caching 3–24
snapshot name 3–22
snapshots
working with 3–20 to 3–32
SNMP traps 4–2
SNMP-Enabled hosts 4–1
storage system 1–3
basic components, illustrated 1–4
changing password 2–13 to 2–14
configuring 3–1
connections, diagram 1–6
deleting from password protection 2–14 to 2–15
Enterprise Virtual Array
example of 1–2
establishing access 2–9
initializing 2–21 to 2–26
managing 3–1
monitoring 4–1
name 2–23
operations 1–5
time and date 4–12 to 4–13
storage systems 2–9
symbols
in text x
on equipment xi
system operational policies

setting 4–15 to 4–16
system operator policies 4–16
system options 4–12
system responses, convention defined x
system time
setting 4–13

T

technical support, Compaq xii
text symbols x

U

unique universal identifier. See UUID
user input, convention defined x
user interface options
setting 2–18
UUID, unique universal identifier 3–7, 3–23

V

variables, convention defined x
virtual disk 3–15
active 3–12
creating
using wizards 2–19
creating a snapclone
advanced options 3–37 to 3–42
creation
wizard 2–19
families 3–13
family
associated disk group 3–15
creating 3–17 to 3–18
date/time 3–15
deleting 3–19
modifying 3–18
modifying a snapclone 3–42
operational state 3–15
point-in-time 3–20
presenting to a host 3–33 to 3–35
temporary. See snapshot
unpresenting to a host 3–35 to 3–36
virtual disks
total 3–13
virtualization
Enterprise Virtual Array storage system
Raid versus Enterprise Virtual Array, illustrated 1–4
working with 3–32 to 3–36
Vraid0 (striping) 3–24
Vraid1 (mirroring) 3–24
Vraid5 (parity striping) 3–24

W

warning
electrical shock hazard symbol, defined xi
excessive weight symbol, defined xi
hot surface symbol, defined xi
multiple power source symbol, defined xi
network interface connection symbol, defined xi
rack stability xii
symbol and definition x
website addresses, convention defined x
websites
Compaq storage xiii
Compaq technical support xii
World Wide Name. See WWN.
write protection level
setting for snapclone 3–40
write-cache policy
for snapshot 3–30
snapshot property 3–24
WWN, World Wide Name 3–22, 3–43