

TruCluster Server

Cluster Hardware Configuration Technical Update for the Enterprise Virtual Array

June 2002

Product Version: TruCluster Server Version 5.1 and 5.1A

Operating System and Version: Tru64 UNIX Version 5.1 and 5.1A

This technical update describes how to configure an Enterprise Virtual Array for Tru64™ UNIX and TruCluster™ Server software installation.

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About This Technical Update

This technical update adds important information to the TruCluster™ Server *Cluster Hardware Configuration* manual about using the Enterprise Virtual Array with the TruCluster Server Version 5.1 and 5.1A software products.

Audience

This technical update is for system administrators who plan to use an Enterprise Virtual Array in a TruCluster Server configuration.

Organization

This technical update is organized as follows:

- Chapter 1* Provides a general overview of the Enterprise Virtual Array.
- Chapter 2* Provides the requirements and restrictions that must be met to configure a TruCluster Server Version 5.1 or Version 5.1A cluster using an Enterprise Virtual Array for storage.
- Chapter 3* Provides an overview of hardware installation and system and storage configuration for configuring a cluster using an Enterprise Virtual Array.
- Chapter 4* Provides procedures, or references to other documentation which provide procedures, to follow for hardware installation and storage configuration.
- Chapter 5* Covers the steps you must complete before installing the Tru64™ UNIX and TruCluster Server software.
- Chapter 6* Describes the use of the scripting utility for the Enterprise Virtual Array.
- Appendix A* Provides a blank table for recording virtual disk information.

Related Documents

Consult the following manuals for assistance in TruCluster Server hardware configuration, installation, administration, and programming tasks:

- QuickSpecs:
 - *TruCluster Server QuickSpecs* — Describes the TruCluster Server Version 5.1B product. You can find the latest version of the TruCluster Server QuickSpecs at: <http://www.compaq.com/products/quickspecs/productbulletin.html>

Select U.S. QuickSpecs or World Wide QuickSpecs, then High Availability & Clustering, then Tru64 UNIX Clustering, and then Compaq TruCluster Server.

- *Enterprise Virtual Array QuickSpecs* — Describes the Enterprise Virtual Array product. You can find the latest version of the Enterprise Virtual Array QuickSpecs at: <http://www.compaq.com/products/quickspecs/productbulletin.html>

Select U.S. QuickSpecs or World Wide QuickSpecs, then Storage Products then Storage Systems. Scroll down the page and select StorageWorks by Compaq Enterprise Virtual Array.

- *Virtual Controller Software (VCS) QuickSpecs* — Describes the Enterprise Virtual Array HSV110 controller software. You can find the latest version of the Enterprise Virtual Array HSV110 controller software QuickSpecs at: <http://www.compaq.com/products/quickspecs/productbulletin.html>

Select U.S. QuickSpecs or World Wide QuickSpecs, then Storage Products then Storage Software. Scroll down the page and select SANworks Virtual Controller Software (VCS) by Compaq.

- Compaq SANworks™ documentation:

- *Release Notes for Enterprise Virtual Array* — Contains the most recent product information about the Compaq StorageWorks Enterprise Virtual Array.
- *Release Notes — Tru64 UNIX Kit V1.0 for Enterprise Virtual Array* — Contains the most recent product information about the Compaq SANworks Tru64 UNIX Kit V1.0 used for integrating host servers with the Compaq StorageWorks Enterprise Virtual Array.
- *Tru64 UNIX Kit V1.0 for Enterprise Virtual Array Installation and Configuration Guide* — Describes how to integrate your servers with an Enterprise Virtual Array.
- *Management Appliance Getting Started Guide* — Explains how to operate the Management Appliance with Open SAN Manager (OSM) and OSM applications.
- *Management Appliance Rack Installation Guide* — Provides step-by-step instructions for mounting the Compaq SANworks Management Appliance into the Compaq Series 9000 rack and the Compaq DS-SW41U Series rack.
- *Management Appliance Element Manager for Enterprise Only User Guide* — Explains how to set up the element manager and use it to configure, manage, and monitor your Enterprise Virtual Array.

- *Scripting Utility V1.0 for Enterprise Virtual Array Reference Guide* — Provides a reference to the commands available in the Scripting Utility V1.0 for the Enterprise Virtual Array.
- *Heterogeneous Open SAN Design Reference Guide* — A guide to designing and building large storage area networks (SANs). It describes how Compaq storage systems, storage management tools, and Fiber Channel products can be used in open heterogeneous SANs.
- Compaq StorageWorks documentation:
 - *Enterprise Virtual Array Read Me First* — Provides important setup information you need to know prior to operating the Enterprise Virtual Array storage system.
 - *Enterprise Virtual Array Rack User Guide* — Provides information on installing, operating, and maintaining the Compaq StorageWorks Enterprise Virtual Array rack.
 - *Enterprise Virtual Array HSV Controller User Guide* — Provides information for operating and maintaining the Compaq StorageWorks Enterprise Virtual Array HSV controller enclosure.
 - *Enterprise Virtual Array Initial Setup User Guide* — Provides step-by-step instructions for setting up the Enterprise Virtual Array storage system and its online interface.
 - *Enterprise Virtual Array Drive Enclosure User Guide* — Provides instructions for installing, configuring, and maintaining the Enterprise Virtual Array rack-mounted drive enclosures.
 - *Enterprise Virtual Array Drive Enclosure EMU User Guide* — Provides instructions for installing and maintaining the Enterprise Virtual Array drive enclosure environmental monitoring unit (EMU).
 - *Heterogeneous Open SAN Design Reference Guide* — Provides topology rules for storage area network (SAN) design.
 - *Addendum — Heterogeneous Open SAN Design Reference Guide — Director Fabric* — Describes the configuration rules for the StorageWorks SAN Director 64 and McDATA ED-5000 director switches, and the ES-3016 and ES-3032 edge switches.
 - *Addendum — Heterogeneous Open SAN Design Reference Guide for Enterprise Virtual Array* — Describes the configuration rules for the Enterprise Virtual Array in a heterogeneous open SAN.
 - *SAN Switch Zoning Reference Guide* — Provides instructions for creating logical device subsets (zones) on a Fibre Channel switch in a storage area network (SAN).

- TruCluster Server documentation:
 - *Cluster Release Notes* — Provides important information about TruCluster Server Version 5.1B, including new features, known problems, and workarounds.
 - *Cluster Technical Overview* — Provides an overview of the TruCluster Server technology.
 - *Cluster Hardware Configuration* — Describes how to set up the processors that are to become cluster members, and how to configure cluster shared storage.
 - *Cluster LAN Interconnect* — Describes how to install and configure LAN hardware for the cluster interconnect.

Note

This manual is only available for TruCluster Server
Version 5.1A.

- *Cluster Installation* — Describes how to install the TruCluster Server product.
- *Cluster Administration* — Describes cluster-specific administration tasks.
- *Cluster Highly Available Applications* — Describes how to deploy applications on a TruCluster Server cluster, and how to write cluster-aware applications.
- The following manuals from the Compaq Tru64 UNIX operating system software documentation set:
 - *Release Notes* — Provides information on new and changed features for the Compaq Tru64 UNIX operating system. It also provides information on restrictions to the software and documentation.
 - *Installation Guide* — Describes the different installation procedures used to install the Compaq Tru64 UNIX operating system on a single system.
 - *System Administration* — Describes advanced installation topics for the Compaq Tru64 UNIX operating system.
 - *Network Administration: Connections* — Describes the tasks for configuring your system to operate in a network, and how to configure the network services.
 - *Network Administration: Services* — Describes the day-to-day management of your network and several utilities and methods you can use to administer network components.

Overview

This technical update to the TruCluster Server *Cluster Hardware Configuration* manual provides important information about support for the Enterprise Virtual Array with the TruCluster Server Version 5.1 and 5.1A products.

1.1 General Overview

The Enterprise Virtual Array was recently qualified for use with the TruCluster Server Version 5.1 and 5.1A products.

No TruCluster Server software release coincides with the availability of support for the Enterprise Virtual Array, so this technical update adds the Enterprise Virtual Array configuration information that will appear in future revisions of the TruCluster Server *Cluster Hardware Configuration* manual. Use this technical update in conjunction with the TruCluster Server *Cluster Hardware Configuration* Version 5.1 and 5.1A manuals.

1.2 Enterprise Virtual Array Overview

The Enterprise Virtual Array is the newest generation of the StorageWorks disk array family of products. It operates with presently qualified Fibre Channel switches and host bus adapters at 1 Gb/sec. In the future, it will fully support 2 Gb/sec hardware.

Two HSV110 controllers are required. They only operate in multiple-bus-failover mode. High availability multipathing capability is required on the host platforms to function properly with the Enterprise Virtual Array.

The dual-redundant controllers access up to 14 Fibre Channel disks per M5214 14-bay disk enclosures. Six or twelve M5214 disk enclosures are presently supported, providing a maximum of 168 36- or 72-GB disks.

The disks are accessed by the HSV110 controllers over dual-redundant Fibre Channel loops that provide a no-single-point-of-failure (NSPOF) configuration.

An Enterprise Virtual Array storage system uses a new virtualization technology and supports VRAID0 (no duplication of data), VRAID1 (all data is duplicated), and VRAID5 (data is protected by parity).

The dual-redundant HSV110 controllers are mounted in an M3220 controller assembly, which also houses two cache batteries and the operator's control panel (OCP).

The M5214 disk enclosures also contain an environmental monitoring unit (EMU), two I/O modules, two blowers, and two power supplies, all of which are hot-pluggable. One operational blower and one operational power supply are all that is required to keep the enclosure fully functional.

A Web browser, either Internet Explorer Version 5.5 (Windows NT or Windows 2000) or Netscape Communicator Version 4.77 (Tru64 UNIX) is used to access and configure the Enterprise Virtual Array.

The Scripting Utility V1.0 for Enterprise Virtual Array (scripting utility) is available for the Tru64 UNIX and Microsoft Windows operating systems. It is a command-line application that allows you to configure and control the HSV110. The scripting utility communicates with the HSV110 controllers through the SANworks Management Appliance (SWMA, or management appliance) and the HSV Element Manager.

You use the HSV Element Manager graphical user interface (GUI), an Open SAN Manager (OSM) application on the management appliance, to configure your Enterprise Virtual Array.

Requirements and Restrictions

This chapter describes the requirements and restrictions for configuring an Enterprise Virtual Array in a TruCluster Server Version 5.1 or Version 5.1A cluster.

For other TruCluster Server restrictions not listed here, see the TruCluster Server QuickSpecs and the hardware requirements and restrictions chapter of the TruCluster Server *Cluster Hardware Configuration* manual.

2.1 Software and Firmware Requirements

Table 2–1 describes the software and firmware requirements necessary for Enterprise Virtual Array operation in a TruCluster Server configuration.

Table 2–1: Enterprise Virtual Array Software and Firmware Requirements

| Software or Firmware | Version |
|--|---|
| Tru64 UNIX/TruCluster Server | Version 5.1 with PK4 BL18 (T64V51B18AS0004-20011114.tar) |
| | Version 5.1A with IPK BL1 (T64V51AB01AS0001-20020116.tar) |
| Minimum SRM Console Firmware | Version 5.9-10 — ES45 |
| | Version 6.0 — DS10, DS20E, ES40, GS80, GS160, and GS320 |
| HSV110 VCS Firmware | 1.02 |
| Open SAN Manager Storage Area Network Application Software | Version 1.0b-18 |
| HSV Element Manager ^a | Version 1.0.0.4 Build 1.0.0.108 |
| SAN Script Utility | Version 3.0BL-92 |

^a The HSV Element Manager for the Enterprise Virtual Array is on the CD-ROM for Compaq SANworks Management Appliance Update for Enterprise Only, November 2001. The CD-ROM is shipped separately from the Enterprise Virtual Array in the Compaq SANworks VCS kit.

2.2 Other Restrictions and Requirements

The requirements and restrictions for use of the Enterprise Virtual Array in a TruCluster Server configuration follow:

- Only the KGPSA-BC, DS-KGPSA-CA, and DS-KGPSA-DA Fibre Channel adapters (FCA) are qualified for use with the Enterprise Virtual Array.

Table 2–2 describes the AlphaServer systems and Fibre Channel adapters that are qualified for use with the Enterprise Virtual Array with the TruCluster Server software.

Table 2–2: AlphaServer Systems and Fibre Channel Adapters Supported with an Enterprise Virtual Array

| AlphaServer System | Fibre Channel Adapter Qualified |
|--------------------------|--|
| DS10, DS20E, ES40 | KGPSA-BC, DS-KGPSA-CA, and DS-KGPSA-DA |
| ES45, GS80, GS160, GS320 | DS-KGPSA-CA and DS-KGPSA-DA |

- Fibre Channel switch zoning must be used with an Enterprise Virtual Array as follows:
 - Each StorageWorks Management Appliance with an HSV Element Manager must be in a zone with the HSV controllers it manages.
 - If multiple clusters are using the same HSV110, each cluster must be in a separate zone.
- Compaq requires that a disk group contain at least eight disks.

Note

The HSV Element Manager help files describe a minimum requirement of four disks, and the HSV Element Manager default is four disks. Do not use the default; you must specify eight disks when creating a disk group.

- The model of Fibre Channel adapter and switches configured with the Enterprise Virtual Array determine the type of fiber-optic cable you use.

The HSV110 controllers, DS-KGPSA-DA Fibre Channel adapter, and McDATA ED-5000 switches accept the small form factor (SFF) Lucent Connector (LC) connector. The other Fibre Channel adapters and switches accept the subscriber connector (SC) connector.

The fiber-optic cables required may be:

- SC to SC
 - SC to LC
 - LC to LC
- The following Fibre Channel switches are supported for use with the Enterprise Virtual Array and TruCluster Server:

- SAN Switch 8 (158222-B21/DS-DSGGB-AA)
- SAN Switch 16 (158223-B21/DS-DSGGB-AB)
- SAN Switch 8-EL (176219-B21/DS-DSGGC-AA)
- SAN Switch 16-EL (212776-B21/DS-DSGGC-AB)
- SAN Switch Integrated/32 (230616-B21/DS-DSGGS-AA)
- SAN Switch Integrated/64 (230617-B21/DS-DSGGS-AB)
- StorageWorks SAN Switch 2GB (240602-B21/DS-DSGGD-AA)
- StorageWorks SAN Director 64 (254512-B21/DS-DMGGD-AA)
- McDATA ED-5000 (2T-M3016-AA) This switch is supported by, but not sold by Compaq.

Note

For switch configuration information, see the *Heterogeneous Open SAN Design Reference Guide, Addendum — Heterogeneous Open SAN Design Reference Guide — Director Fabric*, and *Addendum — Heterogeneous Open SAN Design Reference Guide for Enterprise Virtual Array* manuals.

- A PC or UNIX workstation on the network with the Enterprise Virtual Array with a supported browser is required to access the HSV Element Manager application on the SAN Appliance. The following browsers are supported:
 - Tru64 UNIX — Netscape Communicator Version 4.77 or 4.78
 - Windows NT Version 4.0 (SP 6a) — Netscape Communicator Version 4.77 or 4.78 and Internet Explorer Version 5.01 or 5.5
 - Windows 2000 Version 5.0 (SP 2) — Netscape Communicator Version 4.77 or 4.78 and Internet Explorer Version 5.01 or 5.5
- The Enterprise Virtual Array requires a multipathing environment. Each TruCluster Server AlphaServer system must have two KGPSA Fibre Channel adapters (FCA) connected to separate Fibre Channel switches.

One Fibre Channel switch is connected to Fibre Port 1 (FP1) on both HSV110 controllers. The other Fibre Channel switch is connected to Fibre Port 2 (FP2) on both HSV110 controllers. These cables are SC (switch end) to LC (HSV110 end) fiber-optic cables.
- We recommend setting the OS unit ID for each virtual disk. Numbers between 1 and 32767 (inclusive) can be used. The IDs must be unique

across the entire SAN, not just the HSV110 controllers. The OS unit ID is equivalent to the console user-defined identifier (UDID).

- You cannot connect a terminal or laptop to an HSV110 controller to configure the controllers as you did with an HSG80.

Overview of Cluster Configuration Using an Enterprise Virtual Array

This chapter provides an overview of the steps you need to follow to create a cluster configuration using Enterprise Virtual Array storage. Chapter 4 provides detailed information.

Creating a TruCluster Server configuration using Enterprise Virtual Array storage involves three separate areas:

- Obtaining a virtual controller software (VCS) license key
- Physical component installation
- Configuring the storage area network (SAN) and Enterprise Virtual Array storage system

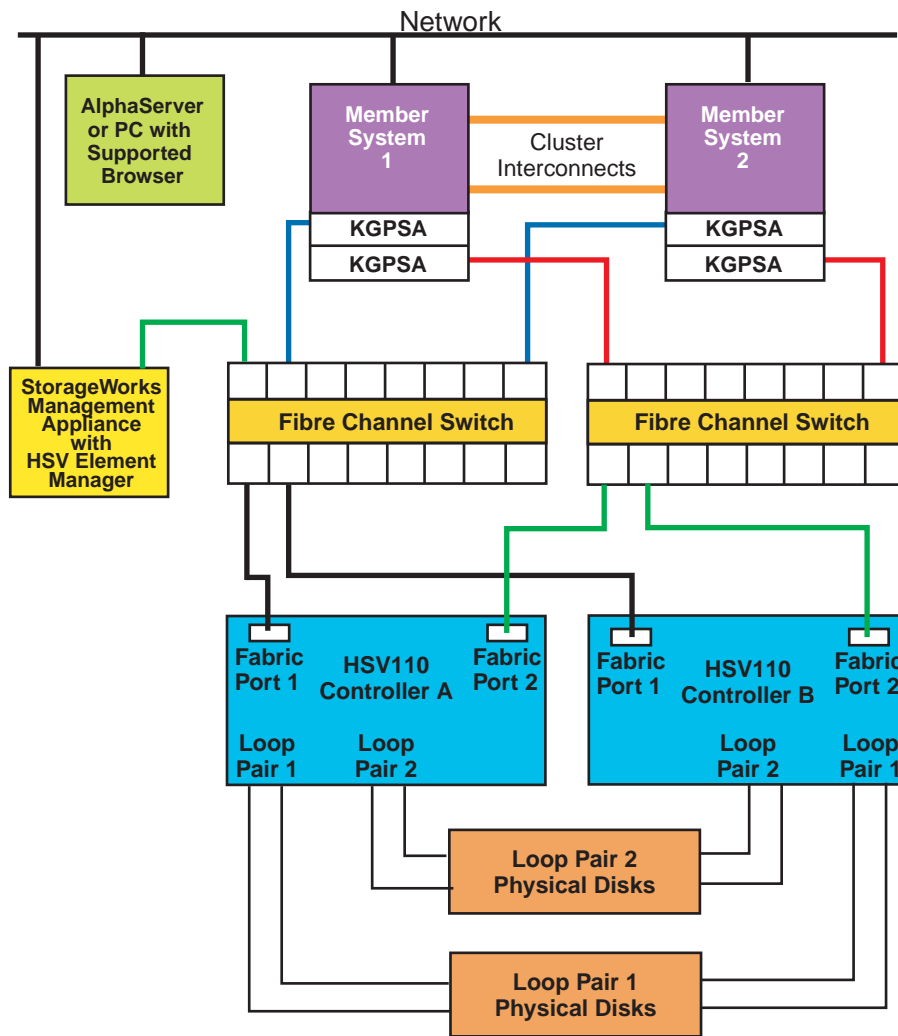
You will use the HSV110 controller worldwide name (WWN) and a Web browser (or e-mail or fax) to obtain license keys that enable you to use the virtual controller software.

You must obtain a VCS license key. Without the license key, the HSV Element Manager will not have access to the HSV110 VCS software. Take the necessary steps to obtain the VCS license keys before you start hardware installation or storage configuration.

The physical components must be installed before the SAN and Enterprise Virtual Array can be configured.

Figure 3–1 shows the minimum hardware required for a cluster configuration using Enterprise Virtual Array storage.

Figure 3–1: Basic Cluster Configuration Using Enterprise Virtual Array Storage



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Install the following hardware components:

- Two to eight AlphaServer systems supported with an Enterprise Virtual Array. Each AlphaServer must have:
 - Two supported KGPSA Fibre Channel adapters
 - A Memory Channel or LAN cluster interconnect (redundant cluster interconnects are required for a NSPOF configuration).
 - Ethernet adapters for connection to the networks

- Two Fibre Channel switches
- The Enterprise Virtual Array storage subsystem with dual HSV100 controllers and Fibre Channel disks
- A SANworks Management Appliance (SWMA)
- A Windows NT, Windows 2000, or Tru64 UNIX workstation on the network with a supported Web browser

Notes

The extra system is not needed if you install the Tru64 UNIX operating system on a local disk. In this case, once the operating system has been installed and configured, you can use the Netscape browser on the AlphaServer to communicate with the HSV110 controller pair.

There is no required order for hardware installation, but storage system configuration must be completed in order.

To configure an Enterprise Virtual Array storage system for Tru64 UNIX and TruCluster Server installation on virtual disks, and install Tru64 UNIX and TruCluster Server software on these disks, follow these steps:

1. Set the Fibre Channel switch IP address and zone the switch, if necessary.
2. Install the SANworks management appliance software, if necessary.
3. Install the HSV Element Manager on the SANworks management appliance.
4. Use the HSV110 operators control panel (OCP) to set the WWN and optional password.
5. Use a Web browser to access the HSV element manager to:
 - Enter the license key
 - Configure the virtual disks
 - Make the virtual disks accessible to the cluster member systems
6. Install the Tru64 UNIX base operating system.
7. Install the required patch kits.
8. Install TruCluster Server software and create a one-member cluster.
9. Add additional cluster members.

Installing the Hardware and Configuring the Enterprise Virtual Array Storage for Cluster Operation

This chapter discusses the following topics:

- Obtaining the Virtual Controller Software (VCS) license keys
- TruCluster Server hardware installation
- Preparing Fibre Channel hardware
- Accessing and Initializing the storage system
- Configuring the Enterprise Virtual Array virtual disks for Tru64 UNIX and TruCluster Server software installation

4.1 Obtaining the VCS License Keys

You need a VCS license key to enable the HSV Element Manager to access the HSV110 VCS software that runs on both of the HSV110 controllers. The license keys are entered into the HSV Element Manager.

There are two types of VCS license keys, the basic license key, which is required, and the optional snapshot licenses (which are based on snapshot capacity). The license keys depend upon the VCS software purchased. See the *Enterprise Virtual Array QuickSpecs* for VCS part numbers.

To obtain the VCS license keys, follow these steps:

1. Locate the worldwide name (WWN) label sheet that ships with the Enterprise Virtual Array storage system. It contains three WWN peel-away labels (one or two of which may have been attached to the storage system).
2. Retrieve each Compaq SANworks VCS License Key Retrieval Instruction Sheet from the Compaq SANworks VCS kit, and optional Compaq SANworks Snapshot for VCS kits.
They provide an authorization ID, and the instructions to obtain a license key from the Compaq license key fulfillment Web site.
3. Follow the instructions, and use the WWN and authorization IDs to obtain the license keys.

Note

If you do not have Web access, obtain the license keys manually through e-mail or fax. The manual process may take up to 48 hours.

4. After you have received the license keys, retain them for later use. You will be required to enter them into the HSV Element Manager.

For more information on license keys, see the *Enterprise Virtual Array Read Me First* and the *Enterprise Virtual Array Initial Setup User Guide*.

4.2 Installing the Hardware

This section discusses hardware installation and installing the hardware to support a TruCluster Server configuration using Enterprise Virtual Array storage.

Install the following hardware:

- Two to eight AlphaServer member systems — You must install a minimum of two KGPSA Fibre Channel adapters in each system. Ensure that each cluster member system is connected to the local network. (See the User's Guide for the AlphaServer system and the TruCluster Server *Cluster Hardware Configuration* manual.)

Note

Before you connect the Fibre Channel host bus adapters to the Fibre Channel switch, determine the Fibre Channel host bus adapter port worldwide names for use when you add a host (cluster member system) or add additional Fibre Channel adapters to a host at the HSV110.

The worldwide name obtained using the console `show configuration` or `show device` commands, or the `wwidmgr -show adapter` command is the node worldwide name, not the port worldwide name. The node worldwide name may start with 2000 in the most significant hex digits, whereas the port worldwide name will start with 1000. The console Version 6.3 firmware may change this behavior.

The HSV110 requires the port worldwide name, and the console will not be able to access the virtual disks if you use the node worldwide name.

The `wwidmgr -show port` command, when executed after the fiber-optic cables are installed, displays all Fibre Channel

host bus adapters connected to the Fibre Channel switch, not just those on the system where the command is being executed.

Obtain the Fibre Channel host bus adapter node worldwide name using the `wwidmgr -show port` command as follows:

```
P00>>> wwidmgr -show port
pga0.0.0.6.1 Link is down.
pgb0.0.0.4.0 Link is down.
[0] 1000-0000-c928-c26a
[1] 1000-0000-c928-c263
```

-
- A minimum of two Fibre Channel switches — (See the User's Guide for the Fibre Channel switch, *Heterogeneous Open SAN Design Reference Guide*, and the TruCluster Server *Cluster Hardware Configuration* manual.)
 - Enterprise Virtual Array storage system — Ensure that each drive enclosure is connected to each of the two independent Fibre Channel arbitrated loop (FC-AL) buses (or loops) through I/O module A and I/O module B as shown in Appendix A of the *Enterprise Virtual Array Initial Setup User Guide*. Each disk drive is connected to both loop A and loop B. (See also the *Tru64 UNIX Kit V1.0 for Enterprise Virtual Array Installation and Configuration Guide*, *Enterprise Virtual Array HSV Controller User Guide*, *Enterprise Virtual Array Drive Enclosure User Guide*, and *Enterprise Virtual Array Drive Enclosure EMU User Guide*.)
 - SANworks Management Appliance — Ensure that the management appliance is connected to the local network, and that the fabric containing the Enterprise Virtual Array storage system it will be controlling. (See the *Management Appliance Getting Started Guide* and *Management Appliance Rack Installation Guide*.)
 - A Windows NT, Windows 2000, or Tru64 UNIX workstation — You need a PC or UNIX workstation with a supported Web browser to access the SANworks Management Appliance (SWMA). It is assumed that you will be installing Tru64 UNIX and TruCluster Server software; therefore, the AlphaServers that are to be cluster members are not yet available. Ensure that this system is connected to the local network. (See the hardware user's guide for your system.)
 - Fibre Channel cabling — See Figure 3-1 and install Fibre Channel cabling as follows:
 1. Install a subscriber connector (SC) to SC, small form factor (SFF) Lucent Connector (LC) to SC, or LC-to-LC fiber-optic cable between pga0 of each system and Fibre Channel switch 1.

2. Install an SC-to-SC, LC-to-SC, or LC-to-LC fiber-optic cable between pgb0 of each system and Fibre Channel switch 2.
3. Install an LC-to-SC or LC-to-LC fiber-optic cable between Fibre Channel switch 1 and HSV110 Controller A fabric port (FP) 1. Install a second LC-to-SC or LC-to-LC fiber-optic cable between Fibre Channel switch 1 and Controller B FP1.
4. Install an LC-to-SC or LC-to-LC fiber-optic cable between Fibre Channel switch 2 and HSV110 Controller A FP2. Install another LC-to-SC or LC-to-LC fiber-optic cable between Fibre Channel switch 2 and HSV110 Controller B FP2.

4.3 Preparing Fibre Channel Hardware

You must complete some tasks before configuring the Enterprise Virtual Array storage for Tru64 UNIX and TruCluster Server software installation.

To prepare for storage system configuration, follow these steps:

1. Ensure that the KGPSA Fibre Channel adapters are set to operate in a fabric.

Use the worldwide ID manager (`wwidmgr`) utility to verify that the topology for all KGPSA Fibre Channel adapters are set to fabric as shown in Example 4-1 and Example 4-2.

Example 4-1: Verifying KGPSA Topology

```
P00>>> wwidmgr -show adapter
Link is down.
item      adapter      WWN              Cur. Topo  Next Topo
pga0.0.0.3.1 - Nvram read failed
[ 0] pga0.0.0.2.0      2000-0000-c922-4aac  FABRIC     UNAVAIL
pgb0.0.0.4.0 - Nvram read failed
[ 1] pgb0.0.0.4.0      2000-0000-c924-4b7b  FABRIC     UNAVAIL
[9999] All of the above.
```

A `Link is down` message indicates that one of the adapters is not available, probably due to its not being plugged into a switch. The warning message `Nvram read failed` indicates that the KGPSA nonvolatile random-access memory (NVRAM) has not been initialized and formatted. The next topology will always be `UNAVAIL` for the host bus adapter that has an unformatted NVRAM. Both messages are benign and can be ignored for the fabric mode of operation.

The display in Example 4-1 shows that both KGPSA host bus adapters are set for fabric topology as the current topology, the default. When operating in a fabric, if the current topology is `FABRIC`, it does not

matter if the next topology is Unavail, or that the NVRAM is not formatted (Nvram read failed).

To correct the Nvram read failed situation and set the next topology to fabric, use the `wwidmgr -set adapter` command as shown in Example 4-2. This command initializes the NVRAM and sets the mode of all KGPSAs to fabric.

Example 4-2: Correcting NVRAM Read Failed Message and Setting KGPSAs to Run on Fabric

```
P00>>> wwidmgr -set adapter -item 9999 -topo fabric
Reformatting nvram
Reformatting nvram
P00>>> init
```

Note

The qualifier in the previous command is `-topo` and not `-topology`. You will get an error if you use `-topology`.

If, for some reason, the current topology is LOOP, you have to change the topology to FABRIC to operate in a fabric. You will never see the Nvram read failed message if the current topology is LOOP. The NVRAM has to have been formatted to change the current mode to LOOP.

Consider the case where the KGPSA current topology is LOOP as follows:

```
P00>>> wwidmgr -show adapter
item  adapter          WWN                Cur. Topo  Next Topo
[ 0] pga0.0.0.2.0      2000-0000-c922-4aac  LOOP      LOOP
[ 1] pgb0.0.0.4.0      2000-0000-c924-4b7b  LOOP      LOOP
[9999] All of the above.
```

If the current topology for an adapter is LOOP, set an individual adapter to FABRIC by using the item number for that adapter (for example, 0 or 1). Use 9999 to set all adapters as follows:

```
P00>>> wwidmgr -set adapter -item 9999 -topo fabric
```

Displaying the adapter information again will show the topology that the adapters will assume after the next console initialization:

```
P00>>> wwidmgr -show adapter
item  adapter          WWN                Cur. Topo  Next Topo
[ 0] pga0.0.0.2.0      2000-0000-c922-4aac  LOOP      FABRIC
[ 1] pgb0.0.0.4.0      2000-0000-c924-4b7b  LOOP      FABRIC
[9999] All of the above.
```

This display shows that the current topology for both KGPSA host bus adapters is LOOP, but will be FABRIC after the next initialization.

```

P00>>> init
P00>>> wwidmgr -show adapter
item  adapter                WWN                Cur. Topo  Next Topo
[ 0]  pga0.0.0.2.0            2000-0000-c922-4aac  FABRIC     FABRIC
[ 1]  pgb0.0.0.4.0            2000-0000-c924-4b7b  FABRIC     FABRIC
[9999] All of the above.

```

Notes

The console remains in wwid manager mode, and you cannot boot until the system is reinitialized. Use the `init` command or a system reset to reinitialize the system after you finish using the wwid manager.

If you try to boot the system and receive the following error, initialize the console to get out of WWID manager mode and reboot:

```

P00>>> boot
warning -- main memory zone is not free
P00>>> init
:
P00>>> boot

```

If you shut down the operating system and try to use the `wwidmgr` utility, you may be prevented from doing so. If you receive the following error, initialize the system and retry the `wwidmgr` command:

```

P00>>> wwidmgr -show adapter
wwidmgr available only prior to booting.
Reinit system and try again.
P00>>> init
:
P00>>> wwidmgr -show adapter
:

```

For more information on the `wwidmgr` utility, see the *Wwidmgr User's Manual*, which is on the Alpha Systems Firmware Update CD-ROM in the `DOC` directory.

2. Set the Fibre Channel switch IP address and, if there are multiple TruCluster Server clusters on the same switch, or any Windows NT or Windows 2000 systems on the same switch with the cluster, zone the switch. See the documentation for your switch and the *SAN Switch Zoning Reference Guide*.

Note

You do not have to place the SANworks Management Appliance (SWMA) and cluster in separate zones.

3. Apply power to the Enterprise Virtual Array storage system and set the worldwide name (WWN) and optional password. Power on the rack, and then power on the HSV110 controllers.

See the *Enterprise Virtual Array HSV Controller User Guide* and enter the HSV110 controller WWN and checksum. Entering the WWN on one controller sets it on both controllers.

Note

If you do not have the system configured and power it off, you must reenter the WWN.

If you want to restrict access to the Enterprise Virtual Array controllers to particular HSV Element Managers, set the eight-character optional password.

4. Install the HSV110 Element Manager software on the Management Appliance.

A CD-ROM containing the HSV Element Manager software, and a card with installation instructions, are supplied with the VCS controller software kit. A VCS controller software kit is required for each HSV110 controller pair.

4.4 Accessing and Initializing the Storage System

This section describes the tasks to prepare the HSV Element Manager to access the Enterprise Virtual Array storage system, and to initialize the storage system.

Complete the following tasks to initialize the storage system prior to configuring the storage system.

- Access the HSV Element Manager
- Establish storage system access and, optionally, change the storage system password
- Enter the license keys — The license keys are based on the controller WWN, and must be entered before the storage system can be initialized
- Initialize the storage system.

4.4.1 Access the HSV Element Manager

To access the HSV Element Manager, follow these steps:

1. Use a supported browser to access the SANworks Management Appliance Open SAN Manager (OSM) where you installed the HSV Element Manager that will be used to configure your storage.

Use a universal resource locator (URL) of `http://SWMAhostID:2301`, where `hostID` is the last six characters of the SANworks Management Appliance serial number.

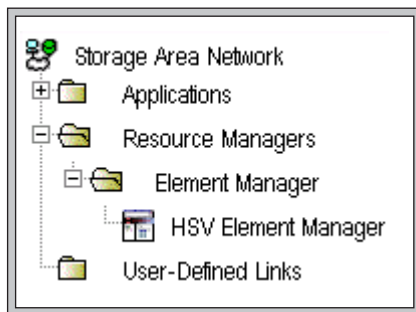
- a. Click MB1 anywhere on the Compaq SANworks Management Appliance splash page to initiate OSM login.
- b. Enter `administrator` as the name and password, and then select OK.

Note

You can change the default administrator account name and password by selecting `changed` in the last line on the page, just to the right of the password pane.

- c. Locate the resource tree in the navigation pane at the left of the OSM user interface as shown in Figure 4-1. Select Resource Managers, then select Element Manager, and then select HSV Element Manager.

Figure 4-1: Open SAN Manager Navigation Pane



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- d. Select the Launch button on the HSV Storage System Summary Page to start the HSV Element Manager as shown in Figure 4-2.

Figure 4–2: Launching the HSV Element Manager



HSV Storage System Summary Page

HSV storage systems offer high-performance, high-availability, storage for a wide variety of applications across your enterprise. Click the **Launch** button to manage your storage using the agent at:

Host: CLASS01 IP Address: 127.0.0.1

| HSV Storage System Network Properties | |
|---------------------------------------|------------|
| Total HSV storage systems: | 1 |
| Total storage space: | 880.13 GB |
| Storage space used: | 125.09 GB |
| Available storage space: | 755.03 GB |
| Management agent software version: | 1. 0. 0. 4 |

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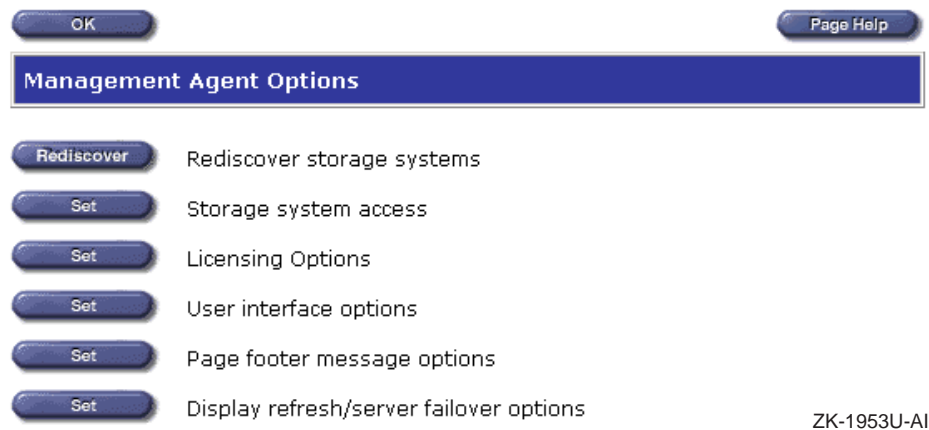
4.4.2 Establish Access to the Storage System

If you set a password on the HSV110 controller, you must establish access to the storage system. Only management agents that have added the storage system password are able to access the storage system.

If the storage system password has been set, you need to add this management agent to those management agents that can control the Enterprise Virtual Array. To set the password, follow these steps:

1. Select Options in the HSV Element Manger session pane.
2. Select Set for Storage system access in the HSV Management Agent Options pane as shown in Figure 4–3.

Figure 4–3: Select Options Window



3. Select Add (Add a storage system).
4. Select the HSV110 worldwide name from the list or enter the HSV110 WWN manually.
5. Enter the password set at the HSV110.
6. Select Add.

For more information, see the *Management Appliance Element Manager for Enterprise Only User Guide*.

4.4.3 Enter the License Keys

The license keys must be entered to enable the HSV Element Manager to access the Enterprise Virtual Array storage system.

To enter the license keys, follow these steps:

1. Select Options in the HSV Element Manager session pane.
2. Select Set for Licensing Options on the HSV Management Agent Options pane as shown in Figure 4–3.
3. Select Enter Lic Line.
4. Enter the license keys in the text box.
5. Select Add a license.

For more information on entering license keys, See the *Management Appliance Element Manager for Enterprise Only User Guide*.

4.4.4 Initialize the Storage System

Storage system initialization is required to bind the HSV110 controllers together as an operational pair. Initialization sets up the first disk group, the default disk group, and establishes preliminary data structures on the disk array.

A disk group is a set or pool of physical disk drives in which a virtual disk is created.

If you have not entered the license keys, you will be prompted to do so when you attempt to initialize the storage system.

To initialize an Enterprise Virtual Array storage system, follow these steps:

1. Select the Uninitialized Storage System icon in the Navigation pane.
2. Select Initialize.
3. Select OK in the confirmation pop-up window.
4. Enter a name for the Enterprise Virtual Array storage system.
5. Specify the number of disks to be in the default disk group.

Caution

You must select at least eight disks for the default disk group.

The HSV Element Manager help on Initializing a Storage System incorrectly states that the minimum number of disks that the default disk group can contain is four. Also, the Initializing an HSV Storage System pop-up window directs you to select a number of disks between 4 and 20.

6. Select Finish.

For more information, see the *Management Appliance Element Manager for Enterprise Only User Guide*.

4.5 Configuring the Virtual Disks for Software Installation

This section describes the steps necessary to set up virtual disks for the Tru64 UNIX and TruCluster Server software installation.

You can create virtual disks with the graphical user interface (GUI) or using the scripting utility (Scripting Utility V1.0 for Enterprise Virtual Array), which is described in Chapter 6.

When using the GUI, there are different ways to configure your virtual disks. You can create the virtual disks, add hosts (cluster member systems),

and then modify the virtual disks to present them to the hosts, a sequence of three distinct operations. Or, you can add hosts before you create the virtual disks, and present the virtual disk to the host when you create the virtual disk. The second method takes fewer operations, and is the method that is covered here.

A suggested virtual disk configuration is shown in Table 4–1. This table only shows virtual disks for a two-member cluster. If there is any possibility of expanding your cluster later on, create the boot disks for all possible cluster members at the same time.

A blank table with provisions for eight cluster member systems is provided in Appendix A.

Table 4–1: Example Virtual Disk Configuration

| Filesystem | Virtual Disk Name ^a | Size | OS Unit ID (UDID) | Device Name | <code>dskn</code> |
|---------------------------|--------------------------------|-------------------|-------------------|-------------|-------------------|
| Tru64 UNIX disk | tru64-unix | 2 GB | 1001 | | |
| Cluster Root (/) | clu-root | 2 GB | 1002 | | |
| Cluster /usr | clu-usr | 8 GB | 1003 | | |
| Cluster /var | clu-var | 6 GB ^b | 1004 | | |
| Member System 1 Boot Disk | member1-boot | 3 GB | 1005 | | |
| Member System 2 Boot Disk | member2-boot | 3 GB | 1006 | | |
| Quorum Disk | clu-quorum | 1 GB ^c | 1007 | | |

^a These virtual disk names are used as example names. Use names that are meaningful to you.

^b The cluster /var filesystem provides enough space for worst case cluster meltdown and the need for crash dumps for both cluster member systems. Three GB is allotted per cluster member system. If you expect to expand to an eight-node cluster, provide at least 24 GB for the cluster /var filesystem.

^c The smallest virtual disk that can be created is a 1-GB virtual disk.

You can use the HSV Element Manager to set up the virtual disks for a Tru64 UNIX and TruCluster Server installation. The disk names, sizes, and OS unit IDs used are as shown in Table 4–1.

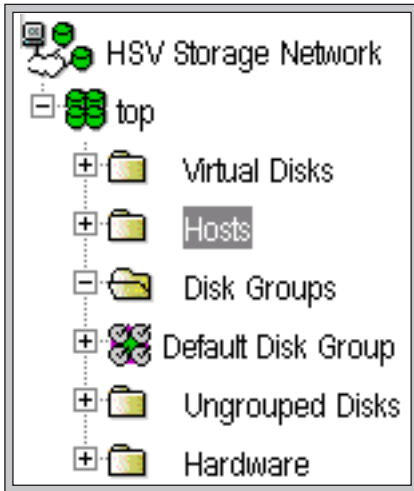
After accessing the HSV Element Manager, hosts will be added, and then the virtual disks will be created using the disks assigned to the default disk group. A folder will be created in the virtual disks folder to hold the operating system and cluster virtual disks to keep them separate from any other virtual disks that may be created.

4.5.1 Adding Hosts (Member Systems) With the Graphical User Interface

Before a virtual disk can be presented to a host (member system), a path must be created from the host's Fibre Channel adapter to the storage system. To add hosts, follow these steps:

1. Using a supported Web browser, access the HSV Element Manager as described in Section 4.4.1.
2. Select the name of the Enterprise Virtual Array in the navigation pane.
3. Select the Hosts folder in the navigation pane as shown in Figure 4-4.

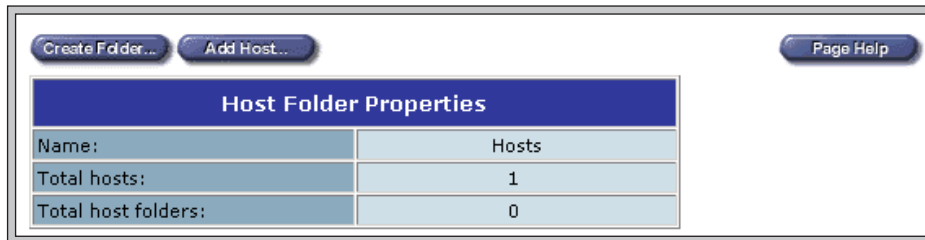
Figure 4-4: Selecting the Hosts Folder



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4. Select Add Host... in the Host Folder Properties pane as shown in Figure 4-5.

Figure 4–5: Host Folder Properties Pane



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5. Enter the following information in the Add a Host pane as shown in Figure 4–6:

- Host name
- Host IP address

Figure 4–6: Adding Host Information



Complete these steps and click **Next Step** to add your host.

STEP 1: Enter the Name

Enter your host's LAN node name.

STEP 2: Enter the IP address

If your host uses a static LAN IP address, enter the address. Skip this step if your host uses dynamic IP addresses.

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6. Select Next Step.
7. Enter the port worldwide name of one of the Fibre Channel adapters on page 2 of the Add a Host pane as shown in Figure 4–7.

Note

Use the port worldwide name (WWN) obtained by issuing the `wwidmgr -show port` command. Do not use the host WWN obtained by issuing the `wwidmgr -show adapter` or console `show dev` commands unless they are the same as the port WWN.

Select Tru64 UNIX as the operating system, then select Next Step.

Figure 4–7: Add a Host Page Two

Previous Step Next Step Cancel Page Help

Add a Host Page 1 Page 2 Page 3

Complete this step and click **Next Step** to continue adding your host.

STEP 3: Enter an adapter port World Wide Name

Click to select from list —OR— 1000-0000-c925-4b31 ?

STEP 4: Select an operating system

Compaq Tru64 UNIX ?

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8. Add any comments pertaining to this host, then select Finish to add the host as shown in Figure 4–8.

Figure 4–8: Adding a Host Page Three

Previous Step Finish Cancel Page Help

Add a Host Page 1 Page 2 Page 3

Continue with these steps to add your host.

STEP 5: Enter your comments

STEP 6: Add your host

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9. When the operation is complete, select OK as shown in Figure 4–9.

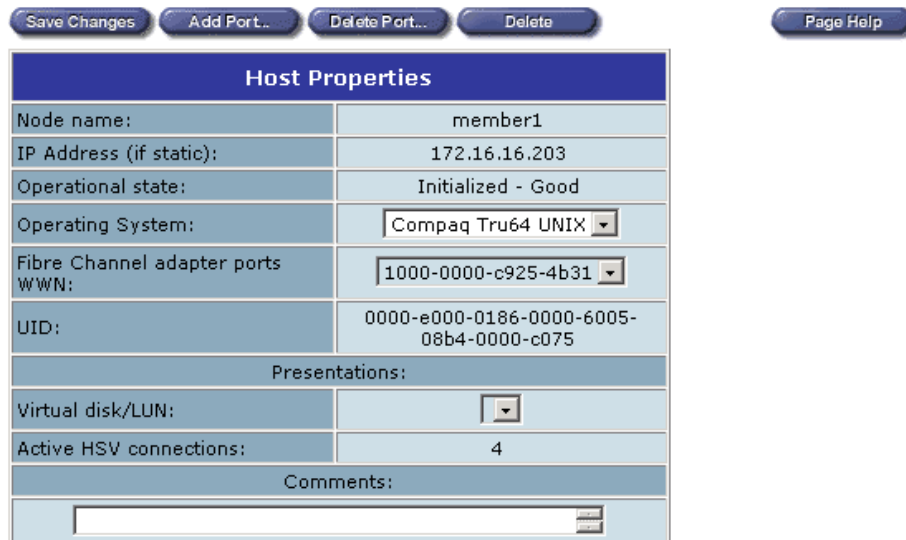
Figure 4–9: Operation Was Successful



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10. Verify that the information in the Host Properties pane is correct as shown in Figure 4–10.

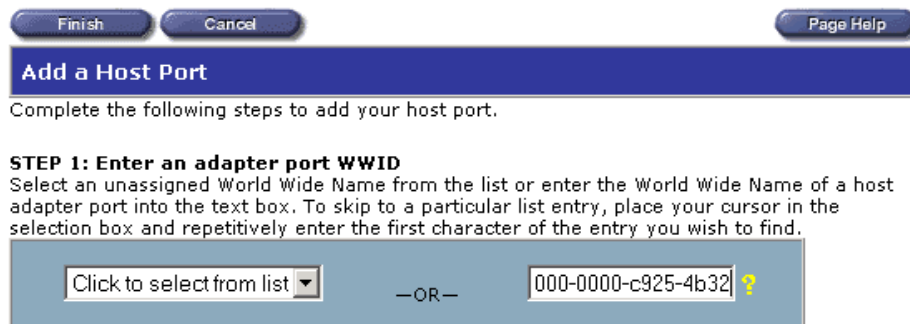
Figure 4–10: Host Properties Pane



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11. Select Add Port... to add another Fibre Channel adapter.
12. Enter the port WWN of the second Fibre Channel adapter in the Add a Host Port pane as shown in Figure 4–11 and select Finish.

Figure 4–11: Adding Another Fibre Channel Adapter to the Host



STEP 2: Add your host port

Click the **Finish** button to add your host port.

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13. Select OK.
14. Verify that the information in the Host Properties window is correct (See Figure 4–10). The WWN of both Fibre Channel adapters can be selected.

Note

If you have additional Fibre Channel adapters on the host, repeat steps 11 through 14 to add them.

15. Select Save Changes, then select OK.
16. Repeat steps 3 through 15 to add additional hosts.

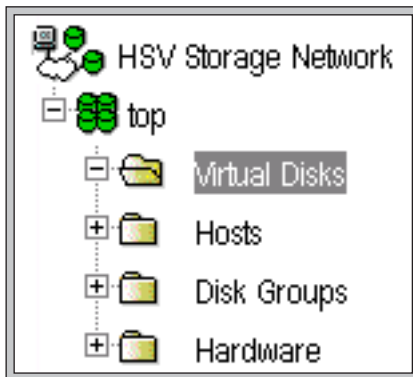
After adding the cluster member systems (hosts) to the Enterprise Virtual Array configuration, the next step is to create a folder for the virtual disks, then create the virtual disks.

4.5.2 Creating a Virtual Disk Folder and Virtual Disks

To create a folder and virtual disks for the Tru64 UNIX and TruCluster Server software installation follow these steps:

1. Select Virtual Disks in the navigation pane as shown in Figure 4–12.

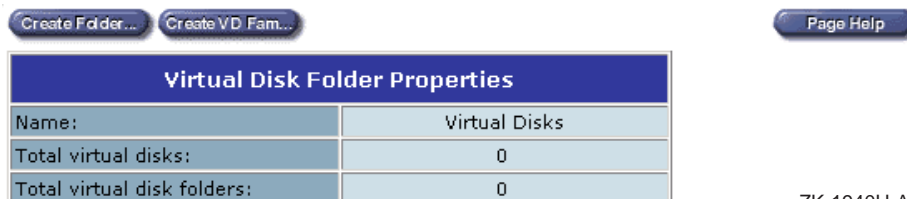
Figure 4–12: Selecting the Virtual Disks



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2. Select **Create Folder...** on the Virtual Disk Folder Properties pane as shown in Figure 4–13.

Figure 4–13: Preparing to Create a Folder or Virtual Disk



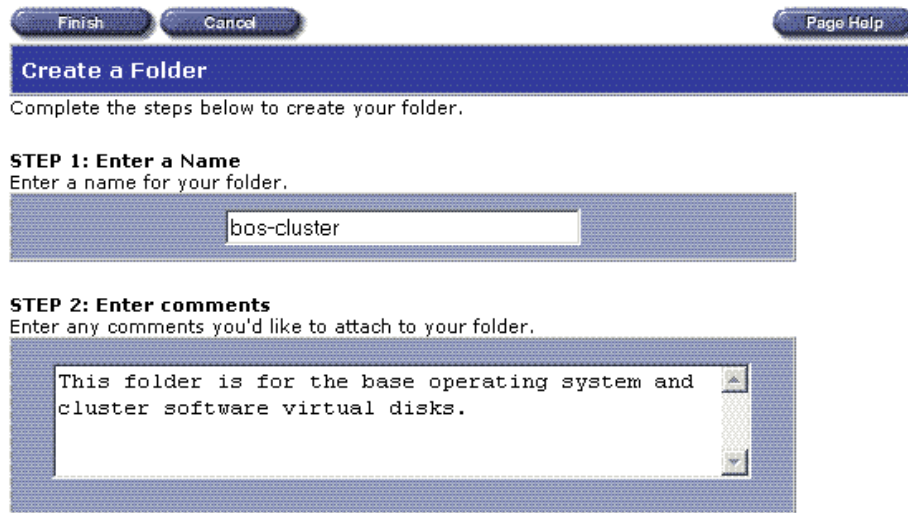
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3. On the Create a Folder window (Figure 4–14), provide a name for the folder, and any comment you may have. Select **Finish** to create the folder.

Note

Step 3 of Figure 4–14 directs you to "Click the **Create Folder** button to create your folder." There is no "Create Folder" button. Select the **Finish** button to create the folder.

Figure 4–14: Creating a Folder for Virtual Disks

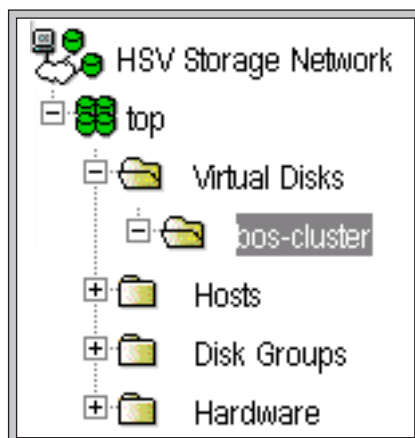


STEP 3: Create Your Folder
Click the **Create Folder** button to create your folder.

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4. Select OK in the Operation Was Successful pane as shown in Figure 4–9 to continue.
5. Select the folder that is to hold the virtual disks in the navigation pane as shown in Figure 4–15.

Figure 4–15: Select the Folder to Hold Virtual Disks



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6. Select Create VD Fam... on the Virtual Disk Folder Properties pane as shown in Figure 4–16.

Figure 4–16: Virtual Disk Folder Properties

| Virtual Disk Folder Properties | |
|--|-------------|
| Name: | bos-cluster |
| Total virtual disks: | 0 |
| Total virtual disk folders: | 0 |
| Comments: | |
| This folder is for the base operating system and | |

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7. Provide the required information for each of the following items in the Create a Virtual Disk Family pane as shown in Figure 4–17:
 - Virtual disk name.
 - Select the disk group.
 - Select the level of data protection (redundancy level: Vraid0 — none; Vraid5 — parity; Vraid1 — mirroring).
 - Enter the size of the virtual disk in GB.
 - Select the write cache policy.
 - Read caching is turned on by default. Select off to turn off read caching.
 - The default is for the virtual disk to be read/write. Select read only if the virtual disk is to be a read-only disk.
 - Provide the OS unit ID. The OS unit ID will allow you to select the virtual disk when you install the software. The OS unit ID must be unique across the entire LAN, not just the HSV110 controllers. Numbers between 1 and 32767 (inclusive) can be used.
 - Select a host to which the virtual disk will be presented. You can only select one host. Others will be added later.
 - Select a controller to be the preferred path for the virtual disk when both controllers are started, and whether or not you want the virtual disk to fail back to that controller if it is restarted and rejoins the other controller.
 - Select Finish to go to the second page of the virtual disk creation sequence.

Figure 4–17: Creating a Virtual Disk

Next Step Cancel Page Help

Create a Virtual Disk Family

Virtual disk name: tru64-unix ?

Disk group name Available GB: Vraid0/Vraid5/Vraid1
Default Disk Group 871.74 697.39 435.84 ?

Redundancy:

Vraid0 ? Space available 871.74 GB
 Vraid5 ? Space available 697.39 GB
 Vraid1 ? Space available 435.84 GB

Size: 2 GB

Write cache policy: Mirrored write-back ?

Read cache policy: On ?

Read/write Read only ?

OS unit ID: 1001 ?

Present to host: member1 ?

Prefer path/mode: Path A-Failover/failback ?

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- On page 2 of the Create a Virtual Disk Family pane (Figure 4–18), enter a LUN number.

Figure 4–18: Page 2 of the Create a Virtual Disk Family Pane

Finish Cancel Page Help

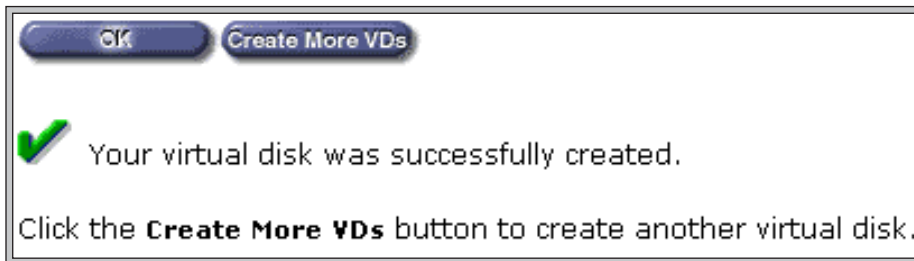
Create a Virtual Disk Family Page 1 Page 2

Host LUN: 1 ?

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- Select Finish to create the virtual disk.
- Select OK as shown in Figure 4–19.

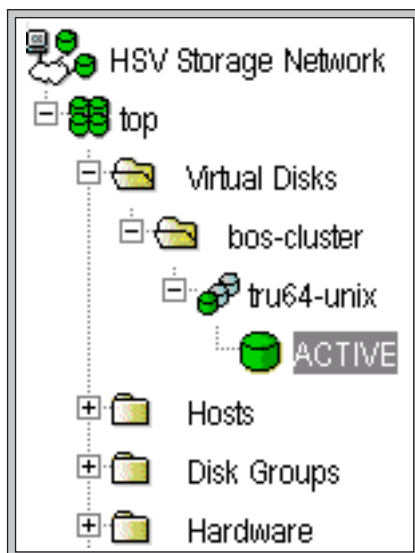
Figure 4–19: Successful Virtual Disk Creation



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11. In the Navigation pane, select Active for the virtual disk just created as shown in Figure 4–20.

Figure 4–20: Selecting the Active Virtual Disk



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12. Select Present... in the Virtual Disk Active Properties pane as shown in Figure 4–21.

Figure 4–21: Preparing to Present the Virtual Disk to Another Host

Save Changes Present... Unpresent... Snapshot... Copy... Page Help

Virtual Disk Active Properties

| Identification | | Condition/State | |
|---------------------|---|----------------------------|--------------------------|
| Name: | ACTIVE | Operational State: | Operating normally |
| Family Name: | tru64-unix | Reservation State: | None |
| World Wide Name: | 0000-E000-010B-0000 | Date/Time | |
| UUID: | 0000-e000-010b-0000-6005-08b4-0000-c075 | Created: | 02-Apr-2002 10:03:04 |
| Attributes | | Presentations | |
| Disk Group: | Default Disk Group | Hosts/LUNs: (Not editable) | member1 @ 1 |
| Capacity Req: | 2 GB | OS Unit ID: | 1001 |
| Capacity Used: | 2 GB | Preferred path/mode: | Path A-Failover/failback |
| Redundancy: | Vraid5 | | |
| Write-cache Policy: | Mirrored write-back | | |
| Read-cache Policy: | On | | |
| Write Protect: | No | | |

Comments

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- To present this virtual disk to another host, select that host in the Present Virtual Disk pane, as shown in Figure 4–22, then select Finish.

Figure 4–22: Selecting Another Host for Virtual Disk Presentation

Finish Adv Options... Cancel Page Help

Present Virtual Disk

Page 1 Page 2

Complete the step below and click the **Finish** button to present your virtual disk in the simplest way possible. If you'd like more control, complete the step and click the **Adv Options** button instead of the **Finish** button.

STEP 1: Select a host:

member2 ?

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- Select OK.
- Verify the entries in the Virtual Disk Active Properties pane as shown in Figure 4–23. The Presentations section provides member system at LUN entries, for example, member1 @ 1 and member2 & 1.

Figure 4–23: Verify the Virtual Disk Properties

| Virtual Disk Active Properties | | | |
|--------------------------------|---|-------------------------------|---|
| Identification | | Condition/State | |
| Name: | ACTIVE | Operational State: | Operating normally |
| Family Name: | tru64-unix | Reservation State: | None |
| World Wide Name: | 0000-E000-010B-0000 | Date/Time | |
| UUID: | 0000-e000-010b-0000-6005-08b4-0000-c075 | Created: | 02-Apr-2002 10:03:04 |
| Attributes | | Presentations | |
| Disk Group: | Default Disk Group | Hosts/LUNs: (Not editable) | <input type="text" value="member1 @ 1"/> |
| Capacity Req: | 2 GB | OS Unit ID: | <input type="text" value="1001"/> |
| Capacity Used: | 2 GB | Preferred path/mode: | <input type="text" value="Path A-Failover/failback"/> |
| Redundancy: | Vraid5 | | |
| Write-cache Policy: | Mirrored write-back | | |
| Read-cache Policy: | <input type="text" value="On"/> | | |
| Write Protect: | <input type="text" value="No"/> | | |

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16. Repeat steps 12 through 15 to present this virtual disk to other hosts.
17. Select Save Changes, then select OK.
18. Repeat steps 5 through 17 to add the remaining virtual disks.

5

Preparing to Install the Software

This chapter covers the steps you must complete before installing the Tru64 UNIX and TruCluster Server software.

Before you can install the base operating system, you must:

- Set the device unit number of the disk where you will install the base operating system software. Setting the device unit number allows the installation scripts to recognize the disk.
- Set the device unit number for the first cluster member boot disk.
- Verify that the console recognizes these disks as valid boot devices.

After installing the base operating system, reset the `bootdef_dev` console environment variable to ensure that there is a path to the boot disk if the HSV110 controllers have failed over.

Before you can install the TruCluster Server software, you must:

- Determine the `diskn` to use for cluster installation.
- Label the disks to be used for cluster installation.

5.1 Set the Device Unit Number

The device unit number is a subset of the device name as shown in a `show device` console display. For example, in the device name `dga1001.1001.0.7.0`, the device unit number is 1001 (as in `dga1001`). The console uses this device unit number to identify a storage unit. When you set a device unit number, you are really setting an alias for the device worldwide name (WWN). The 64-bit WWN is too large to be used as the device unit number, so an alias is used instead.

This section describes how to use the `wwidmgr -quickset` command to set the device unit number for the Fibre Channel disks to be used as the Tru64 UNIX Version 5.1B installation disk or cluster member system boot disks. Setting the device unit number allows the installation scripts to recognize a Fibre Channel disk.

To set the device unit number for a Fibre Channel device, follow these steps:

1. From Table 4–1, obtain the OS unit ID for the virtual disk to be used as the Tru64 UNIX Version 5.1B installation disk or cluster member

system boot disks. The OS unit ID is referred to as the user-defined identifier (UDID) by the console software.

For instance, in Table 4–1, the Tru64 UNIX disk has an OS unit ID of 1001. The OS unit ID for the cluster member 1 boot disk is 1005, and the cluster member 2 boot disk is 1006.

2. From the AlphaServer console, use the `wwidmgr -clear all` command to clear the stored Fibre Channel `wwid1`, `wwid2`, `wwid3`, `wwid4`, `N1`, `N2`, `N3`, and `N4` console environment variables. You want to start with all `wwidn` and `Nn` variables clear.

A console initialization is generally required before you can use the `wwidmgr` command. For example:

```
P00>>> init
      :
P00>>> wwidmgr -clear all
P00>>> show wwid*
wwid0
wwid1
wwid2
wwid3
P00>>> show n*
N1
N2
N3
N4
```

Note

The console only creates devices for which the `wwidn` console environment variable has been set, and are accessible through an HSV110 N_Port as specified by the `Nn` console environment variable also being set. These console environment variables are set with the `wwidmgr -quickset` or `wwidmgr -set wwid` commands. The use of the `wwidmgr -quickset` command is shown in the next step.

3. Use the `wwidmgr` command with the `-quickset` option to set a device unit number for the Tru64 UNIX Version 5.1B installation disk and the first cluster member system boot disk.

The `wwidmgr` command with the `-quickset` option is used to define a device unit number, based on the OS unit ID (also known as the UDID at the console), as an alias for the WWN for the Tru64 UNIX installation disk and the first cluster member system boot disk. The `wwidmgr -quickset` utility sets the device unit number and also

provides a display of the device names and how the disk is reachable (reachability display).

The `wwidmgr -quickset` command may generate multiple device names for a given device unit number, because each possible path to a storage unit is given its own device name.

Set the device unit number for the Tru64 UNIX Version 5.1B installation disk and the first cluster member system boot disk as follows:

- a. Set the device unit number for the Tru64 UNIX Version 5.1B installation disk to 1001 as shown in Example 5–1.

Example 5–1: Setting the Device Unit Number for the BOS Installation Disk

```
P00>>> wwidmgr -quickset -udid 1001
```

Disk assignment and reachability after next initialization:

| | via adapter: | via fc nport: | connected: |
|---|--------------|---------------------|------------|
| 6005-08b4-0001-00b2-0000-c000-025f-0000 | | | |
| dga1001.1001.0.7.0 | pga0.0.0.7.0 | 5000-1fe3-0008-de8c | No |
| dga1001.1002.0.7.0 | pga0.0.0.7.0 | 5000-1fe3-0008-de89 | Yes |
| dga1001.1003.0.7.0 | pga0.0.0.7.0 | 5000-1fe3-0008-de8d | No |
| dga1001.1004.0.7.0 | pga0.0.0.7.0 | 5000-1fe3-0008-de88 | Yes |
| dgb1001.1001.0.8.1 | pgb0.0.0.8.1 | 5000-1fe3-0008-de8c | Yes |
| dgb1001.1002.0.8.1 | pgb0.0.0.8.1 | 5000-1fe3-0008-de89 | No |
| dgb1001.1003.0.8.1 | pgb0.0.0.8.1 | 5000-1fe3-0008-de8d | Yes |
| dgb1001.1004.0.8.1 | pgb0.0.0.8.1 | 5000-1fe3-0008-de88 | No |

The `wwidmgr -quickset` command provides a reachability display equivalent to issuing the `wwidmgr -show reachability` command. The reachability part of the display provides the following information:

- The WWN for the storage unit that is to be accessed.
 - The new device name for the storage unit.
 - The KGPSA adapters through which a connection to the storage unit is potentially available.
 - The WWID of the HSV110 port(s) (N_Ports) that will be used to access the storage unit.
 - In the `connected` column, whether the storage unit is currently available through the KGPSA to HSV110 controller port connection.
- b. Set the device unit number for the first cluster member system boot disk to 1005 as shown in Example 5–2.

Example 5–2: Setting the Device Unit Number for the First Cluster Member Boot Disk

```
P00>>> wwidmgr -quickset -udid 1005
```

Disk assignment and reachability after next initialization:

```
6005-08b4-0001-00b2-0000-c000-025f-0000
      via adapter:      via fc nport:      connected:
dga1001.1001.0.7.0      pga0.0.0.7.0      5000-lfe3-0008-de8c      No
dga1001.1002.0.7.0      pga0.0.0.7.0      5000-lfe3-0008-de89      Yes
dga1001.1003.0.7.0      pga0.0.0.7.0      5000-lfe3-0008-de8d      No
dga1001.1004.0.7.0      pga0.0.0.7.0      5000-lfe3-0008-de88      Yes

dgb1001.1001.0.8.1      pgb0.0.0.8.1      5000-lfe3-0008-de8c      Yes
dgb1001.1002.0.8.1      pgb0.0.0.8.1      5000-lfe3-0008-de89      No
dgb1001.1003.0.8.1      pgb0.0.0.8.1      5000-lfe3-0008-de8d      Yes
dgb1001.1004.0.8.1      pgb0.0.0.8.1      5000-lfe3-0008-de88      No

6005-08b4-0001-00b2-0000-c000-0277-0000
      via adapter:      via fc nport:      connected:
dga1005.1001.0.7.0      pga0.0.0.7.0      5000-lfe3-0008-de8c      No
dga1005.1002.0.7.0      pga0.0.0.7.0      5000-lfe3-0008-de89      Yes
dga1005.1003.0.7.0      pga0.0.0.7.0      5000-lfe3-0008-de8d      No
dga1005.1004.0.7.0      pga0.0.0.7.0      5000-lfe3-0008-de88      Yes

dgb1005.1001.0.8.1      pgb0.0.0.8.1      5000-lfe3-0008-de8c      Yes
dgb1005.1002.0.8.1      pgb0.0.0.8.1      5000-lfe3-0008-de89      No
dgb1005.1003.0.8.1      pgb0.0.0.8.1      5000-lfe3-0008-de8d      Yes
dgb1005.1004.0.8.1      pgb0.0.0.8.1      5000-lfe3-0008-de88      No
```

- c. A console initialization is required to exit the `wwidmgr`, and to make the device names available to the console `show dev` command:

```
P00>>> init
      ⋮
```

The device names have now been set for the Tru64 UNIX disk and first cluster member system boot disks.

In the reachability portion of the display, each storage set is reachable from KGPSA `pga` through two HSV110 ports and from KGPSA `pgb` through two HSV110 ports. Also, the device unit number has been set for each KGPSA to HSV110 controller port connection, even if the storage unit is not currently reachable via that connection.

5.2 Displaying Valid Boot Devices

The only Fibre Channel devices that are displayed by the console `show dev` command are those devices that have been assigned to a `wwidn` environment variable with the `wwidmgr -quickset` command.

Any device shown in the reachability display can be used as a boot device. The `bootdef_dev` console environment variable can be set to any, or several, of these devices. Also, the cluster installation script sets the `bootdef_dev` console environment variable to up to four of these devices.

If you issue the `show wwid*` console command now, it will show that the environment variable `wwidn` is set for two disks. Also, the `show n*` command shows that the units are accessible through four HSV110 N_Ports as follows:

```
P00>>> show wwid*
wwid0      1001 1 WWID:01000010:6005-08b4-0001-00b2-0000-c000-025f-0000
wwid1      1005 1 WWID:01000010:6005-08b4-0001-00b2-0000-c000-0277-0000
wwid2
wwid3
P00>>>show n*
N1          50001fe30008de8c
N2          50001fe30008de89
N3          50001fe30008de8d
N4          50001fe30008de88
```

Example 5–3 provides sample device names as displayed by the `show dev` command after using the `wwidmgr -quickset` command to set the device unit numbers. These devices are available to use as boot devices.

Example 5–3: Sample Fibre Channel Device Names

```
P00>>> show dev
dga1001.1001.0.7.0      $1$DGA1001  COMPAQ HSV110 (C)COMPAQ 1010
dga1001.1002.0.7.0      $1$DGA1001  COMPAQ HSV110 (C)COMPAQ 1010
dga1001.1003.0.7.0      $1$DGA1001  COMPAQ HSV110 (C)COMPAQ 1010
dga1001.1004.0.7.0      $1$DGA1001  COMPAQ HSV110 (C)COMPAQ 1010
dgb1001.1001.0.8.1      $1$DGB1001  COMPAQ HSV110 (C)COMPAQ 1010
dgb1001.1002.0.8.1      $1$DGB1001  COMPAQ HSV110 (C)COMPAQ 1010
dgb1001.1003.0.8.1      $1$DGB1001  COMPAQ HSV110 (C)COMPAQ 1010
dgb1001.1004.0.8.1      $1$DGB1001  COMPAQ HSV110 (C)COMPAQ 1010
dga1005.1001.0.7.0      $1$DGA1005  COMPAQ HSV110 (C)COMPAQ 1010
dga1005.1002.0.7.0      $1$DGA1005  COMPAQ HSV110 (C)COMPAQ 1010
dga1005.1003.0.7.0      $1$DGA1005  COMPAQ HSV110 (C)COMPAQ 1010
dga1005.1004.0.7.0      $1$DGA1005  COMPAQ HSV110 (C)COMPAQ 1010
dgb1005.1001.0.8.1      $1$DGB1005  COMPAQ HSV110 (C)COMPAQ 1010
dgb1005.1002.0.8.1      $1$DGB1005  COMPAQ HSV110 (C)COMPAQ 1010
dgb1005.1003.0.8.1      $1$DGB1005  COMPAQ HSV110 (C)COMPAQ 1010
dgb1005.1004.0.8.1      $1$DGB1005  COMPAQ HSV110 (C)COMPAQ 1010
dka500.5.0.2000.1      DKA500          RRD47 1206
dkb0.0.0.2001.1      DKB0          RZ1CD-CS 0306
:
:
:
pga0.0.0.7.0          PGA0          WWN 2000-0000-c928-2c95
pgb0.0.0.8.1          PGB0          WWN 2000-0000-c925-2c50
:
:
:
```

Note

The only Fibre Channel devices displayed by the console `show dev` command are those devices that have been assigned to a `wwidn` environment variable.

At this point you are ready to install the Tru64 UNIX operating system and TruCluster Server software.

5.3 Install the Base Operating System

After you read the TruCluster Server *Cluster Installation* manual, and using the Tru64 UNIX *Installation Guide* as a reference, boot from the CD-ROM and perform a full installation of the Tru64 UNIX Version 5.1B operating system.

When the installation procedure displays the list of disks that are available for operating system installation as shown here, look for the identifier in the Location column. Verify the identifier from Table 4-1.

Select a disk for the root file system. The root file system will be placed on the "a" partition of the disk you choose.

To visually locate a disk, enter "ping <disk>", where <disk> is the device name (for example, dsk0) of the disk you want to locate. If that disk has a visible indicator light, it will blink until you are ready to continue.

| | Device Name | Size in GB | Controller Type | Disk Model | Location |
|-----|-------------|------------|-----------------|------------|--------------------|
| 1) | dsk0 | 4.0 | SCSI | RZ1CD-CS | bus-1-targ-0-lun-0 |
| 2) | dsk1 | 4.0 | SCSI | RZ1CD-CS | bus-1-targ-1-lun-0 |
| 3) | dsk2 | 4.0 | SCSI | RZ1CD-CS | bus-1-targ-2-lun-0 |
| 4) | dsk3 | 8.5 | SCSI | HSZ80 | bus-2-targ-1-lun-1 |
| 5) | dsk4 | 8.5 | SCSI | HSZ80 | bus-2-targ-1-lun-2 |
| 6) | dsk5 | 8.5 | SCSI | HSZ80 | bus-2-targ-1-lun-3 |
| 7) | dsk6 | 8.5 | SCSI | HSZ80 | bus-2-targ-1-lun-4 |
| 8) | dsk7 | 8.5 | SCSI | HSZ80 | bus-2-targ-1-lun-5 |
| 9) | dsk8 | 8.5 | SCSI | HSZ80 | bus-2-targ-1-lun-6 |
| 10) | dsk9 | 2.0 | SCSI | HSV110 | IDENTIFIER=1001 |
| 11) | dsk13 | 3.0 | SCSI | HSV110 | IDENTIFIER=1005 |

Record the `/dev/disk/dskn` value (dsk9) for the Tru64 UNIX disk that matches the identifier (1001) (See Table 4-1).

Complete the installation, following the instructions in the Tru64 UNIX *Installation Guide*.

If you are only installing the base operating system, and not installing TruCluster Server, set the `bootdef_dev` console environment variable to multiple paths before you boot the operating system (see Section 5.4).

5.4 Reset the `bootdef_dev` Console Environment Variable

After installing the cluster software, shut down the operating system. Use the console `show device` command to verify that the `bootdef_dev` console environment variable is set to select multiple paths to the boot device and not just one path.

If it is set to select only one path to the boot device, set it to select multiple paths as follows:

1. Examine the reachability display provided by the `wwidmgr -show reachability` command for the device names that can access the storage unit from which you are booting.
2. Set the `bootdef_dev` console environment variable to provide multiple paths to the boot disk.

Notes

Choose device names that show up as both `Yes` and `No` in the reachability display `connected` column. Note, that for multiple-bus failover, only one controller is normally active for a storage unit. You must ensure that the unit is reachable if the controllers have failed over.

Use device names for at least two host bus adapters.

For example, to ensure that you have a connected boot path in case of a failed host bus adapter or controller failover, choose device names for multiple host bus adapters and each controller port. If you use the reachability display for member system 1's boot disk as shown in Example 5-2, you could choose any of the following device names when setting the `bootdef_dev` console environment variable for the first cluster member system:

```
dga1001.1001.0.7.0
dga1001.1002.0.7.0
dga1001.1003.0.7.0
dga1001.1004.0.7.0
```

```
dgb1001.1001.0.8.1
dgb1001.1002.0.8.1
dgb1001.1003.0.8.1
dgb1001.1004.0.8.1
```

If the `bootdef_dev` console environment variable ends up with all boot paths in an `unconnected` state, you can use the `ffauto` or `ffnext` console environment variables to force a boot device from a `not connected` to a `connected` state.

The `ffauto` console environment variable is effective only during autoboots (boots other than manual boots). Use the `set ffauto on` console command to enable `ffauto`. (The default for `ffauto` is `off`.) It is stored in nonvolatile memory so it persists across system resets and power cycles.

During an autoboot, the console attempts to boot from each connected device listed in the `bootdef_dev` console environment variable. If `ffauto` is on, and if the end of devices listed in `bootdef_dev` is reached without successfully booting, the console starts again at the beginning of the devices listed in the `bootdef_dev` console environment variable. This time, devices that are not connected are changed to `connected` and an attempt is made to boot from that device.

The `ffnext` console environment variable is a one-time variable. It does not persist across a system reset, power cycle, or reboot. This variable may be used (`set ffnext on`) to cause the next command to a not connected device to change the state to `connected`. After the command has been executed, the `ffnext` variable is automatically set to `off`, so it has no further effect.

For more information on using the `ffauto` and `ffnext` console environment variables, see the *Wwidmgr User's Manual*.

3. Set the `bootdef_dev` console environment variable for the base operating system boot disk to a comma-separated list of several of the boot paths that show up in the reachability display (`wwidmgr -show reachability`). You must initialize the system to use any of the device names in the `bootdef_dev` variable as follows:

```
P00>>> set bootdef_dev \  
dga1001.1001.0.7.0,dga1001.1002.0.7.0 \  
dgb1001.1001.0.8.1,dgb1001.1002.0.8.1  
P00>>> init
```

Note

The console System Reference Manual (SRM) software guarantees that you can set the `bootdef_dev` console environment variable to a minimum of four device names. You may be able to set it to five, but only four are guaranteed.

5.5 Determining /dev/disk/dskn to Use for a Cluster Installation

Before installing the TruCluster Server software, you must determine which /dev/disk/dskn to use for the various TruCluster Server disks.

To determine the /dev/disk/dskn to use for the cluster disks, follow these steps:

1. With the Tru64 UNIX Version 5.1B operating system at single-user or multi-user mode, use the hardware manager utility (`hwmgr`) with the `-view devices` option to display all devices on the system. Pipe the command through the `grep` utility to search for any items with the `IDENTIFIER` qualifier:

```
# hwmgr -view dev | grep IDENTIFIER
HWID: Device Name           Mfg      Model           Location
-----
86: /dev/disk/dsk9c         COMPAQ   HSV110 (C)COMPAQ IDENTIFIER=1001
87: /dev/disk/dsk10c        COMPAQ   HSV110 (C)COMPAQ IDENTIFIER=1002
88: /dev/disk/dsk11c        COMPAQ   HSV110 (C)COMPAQ IDENTIFIER=1003
89: /dev/disk/dsk12c        COMPAQ   HSV110 (C)COMPAQ IDENTIFIER=1004
90: /dev/disk/dsk13c        COMPAQ   HSV110 (C)COMPAQ IDENTIFIER=1005
91: /dev/disk/dsk14c        COMPAQ   HSV110 (C)COMPAQ IDENTIFIER=1006
92: /dev/disk/dsk15c        COMPAQ   HSV110 (C)COMPAQ IDENTIFIER=1007
```

If you know that you have set the UDID for a large number of disks, you can also search for the UDID:

```
# hwmgr -view dev | grep IDENTIFIER | grep 1002
HWID: Device Name           Mfg      Model           Location
-----
87: /dev/disk/dsk10c        COMPAQ   HSV110 (C)COMPAQ IDENTIFIER=1002
```

2. Search the display for the identifiers (OS unit IDs) for each of the cluster installation disks and record the /dev/disk/dskn values in Table A-1.

If you use the `grep` utility to search for a specific UDID, for example, `hwmgr -view dev | grep IDENTIFIER=1002`, repeat the command to determine the /dev/disk/dskn for each of the remaining cluster disks. Record the information for use when you install the cluster software.

You must label the disks before you install cluster software.

5.6 Label the Disks to Be Used to Create the Cluster

Before you run `clu_create` to create the first cluster member or `clu_add_member` to add subsequent cluster members, you must label the disks to be used for cluster software.

On the system where you installed the Tru64 UNIX operating system, if you have not already done so, boot the system. Determine the /dev/disk/dskn values to use for cluster installation (See Table 4-1).

Initialize disklabels for all disks needed to create the cluster. The example (See Table 4–1) uses disks `dsk10` [cluster root (/)], `dsk11` (/usr), `dsk12` (/var), and `dsk15` (Quorum). For example:

```
# disklabel -z dsk 10
disklabel: Disk /dev/rdisk/dsk10c is unlabeled
#disklabel -rw dsk10 HSV110
```

5.7 Install the TruCluster Server Software and Create the First Cluster Member

After labeling the disks, use the TruCluster Server *Cluster Installation* procedures and install the TruCluster Server software on the first cluster member (the system where you just installed Tru64 UNIX).

After installing the TruCluster Server software subsets, run the `clu_create` command to create the first cluster member using the procedures in the TruCluster Server *Cluster Installation* manual.

5.8 Add Additional Systems to the Cluster

To add additional systems to the cluster, follow this procedure:

1. On the system where you installed the Tru64 UNIX operating system and TruCluster Server software, boot the system into the cluster as a single-member cluster.
2. Referring to the TruCluster Server *Cluster Installation* manual procedures, use `clu_add_member` to add a cluster member.

Before you boot the system being added to the cluster, on the newly added cluster member:

- a. Use the `wwidmgr` utility with the `-quickset` option to set the device unit number for the member system boot disk as shown in Example 5–4. For member system 2 in the example configuration, it is the storage unit with OS unit ID 1006 (Table 4–1):

Example 5–4: Setting Device Unit Number for Additional Member System

```
P00>>> wwidmgr -quickset -udid 1006
```

Disk assignment and reachability after next initialization:

| | via adapter: | via fc nport: | connected: |
|---|--------------|---------------------|------------|
| 6005-08b4-0001-00b2-0000-c000-029d-0000 | | | |
| dga1006.1001.0.7.0 | pga0.0.0.7.0 | 5000-lfe3-0008-de8c | No |
| dga1006.1002.0.7.0 | pga0.0.0.7.0 | 5000-lfe3-0008-de89 | Yes |
| dgb1006.1001.0.8.1 | pgb0.0.0.8.1 | 5000-lfe3-0008-de8d | No |
| dgb1006.1002.0.8.1 | pgb0.0.0.8.1 | 5000-lfe3-0008-de88 | Yes |

```
P00>>> init
```

- b. Set the `bootdef_dev` console environment variable to one reachable path (Yes in the connected column of Example 5–4) to the member system boot disk:

```
P00>>> set bootdef_dev dga1006.1002.0.7.0
```

- c. Boot `genvmunix` on the newly added cluster member system. Each installed subset will be configured and a new kernel will be built and installed.
3. Boot the new cluster member system into the cluster and complete the cluster installation.
 4. Repeat steps 2 and 3 for other cluster member systems.

6

Using the Scripting Utility

For large or complex configurations, you can use the Storage System Scripting Utility (SSSU or scripting utility) instead of the graphical user interface (GUI). The scripting utility is a character-cell interface to the HSV Element Manager.

The scripting utility executable is available in the operating system solutions kit, and is named `sssu` or `SSSU.EXE`, depending on the operating system.

You can run the scripting utility from the CD-ROM `SSSU` directory, or copy it to your system (for example, `/usr/local/bin`). Ensure that you change permissions so the file is executable on your Tru64 UNIX system.

Note

If password access to the HSV110 controllers is enabled, it has to be set up from the HSV110 Element Manager before you can use the scripting utility; you cannot set password access using the scripting utility.

6.1 Starting the Scripting Utility

You can start the scripting utility in two ways:

1. By providing arguments on the command line. In this case, the commands are echoed, executed, and then the scripting utility exits to the command line.

Enclose the command arguments in double quotation marks (" ").

The following example uses the scripting utility with command-line arguments:

```
# sssu "FILE /san/scripts/eva01-config.ssu"  
:
```

Note

The file is not required to have an extension.

2. When started without command-line arguments, no commands are executed and the `NoCellSelected>` prompt is displayed.

Before any useful commands can be issued, you have to select the HSV110 Element Manager (so the scripting utility can communicate with it), and add a storage cell (the set of HSV110 controllers you want to use).

When you select the cell, the prompt will change to the name of the cell as shown in Example 6–1.

Example 6–1: Preparing the Scripting Utility to Access an HSV110 Controller Pair

```
# sssu

SSSU version 3.0 Build 92
EMClientAPI Version 1.6, Build date: Sep 14 2001

NoCellSelected> SELECT MANAGER swmaxxxxxxx Username=XXXXX Password=XXXXX
NoCellSelected> SELECT CELL Enterprise10
Enterprise10>
```

Note

If the HSV Element Manager GUI has not been used to initialize the HSV110 controller pair, you can initialize it with the `ADD CELL` command. You must select the uninitialized cell, add the cell (providing it with the cell name), then select the initialized cell. For example:

```
# sssu

SSSU version 3.0 Build 92
EMClientAPI Version 1.6, Build date: Sep 14 2001

NoCellSelected> SELECT MANAGER swmaxxxxxxx Username=XXXXX Password=XXXXX
NoCellSelected> SHOW CELL

Cells available on this Manager:
Uninitialized Storage System
NoCellSelected> SELECT CELL "Uninitialized Storage System"
Uninitialized Storage System> ADD CELL Enterprise10
Uninitialized Storage System> SELECT CELL Enterprise10
Enterprise10>
```

6.2 Capturing an Existing Configuration With the Scripting Utility

After you have set up an Enterprise Virtual Array configuration with the GUI, you can use the scripting utility to save the configuration. The `CAPTURE CONFIGURATION` command accesses the selected cell and creates a script, which can be used to re-create the configuration (if that becomes necessary).

The default output for the `CAPTURE CONFIGURATION` command is standard output. Provide a file name if you want the configuration script output redirected to a file. You can use the script created by the scripting utility to rebuild the configuration, if that becomes necessary, or use it as a model to create other scripts for more complex configurations.

Example 6–2 shows how to capture the present configuration.

Example 6–2: Capturing the Enterprise Virtual Array Configuration

```
# sssu

SSSU version 3.0 Build 92
EMClientAPI Version 1.6, Build date: Sep 14 2001

NoCellSelected> SELECT MANAGER swmaxxxxxx Username=XXXXX Password=XXXXX
NoCellSelected> SELECT CELL Enterprise10
Enterprise10> CAPTURE CONFIGURATION /san/scripts/create-enterprise10.ssu
    CAPTURE CONFIGURATION may take awhile. Do not modify configuration
    until command is complete.

.....
    Capture complete and successful
```

6.3 Using the Scripting Utility With the File Command

If you are creating a large or complex configuration, or if you have to re-create a configuration, use the scripting utility with the `FILE` command.

The `FILE` command reads commands from the named file. An end-of-file or an `EXIT` command causes a return to the command prompt.

Note

Do not attempt to re-create an HSV110 configuration with a file created by the `CAPTURE CONFIGURATION` command if any portion of the of the original configuration still exists; the script will terminate execution.

You can re-create the configuration captured in Example 6–2 as shown in Example 6–3.

Example 6–3: Using the Scripting Utility File Command With a Script File

```
# sssu

SSSU version 3.0 Build 92
EMClientAPI Version 1.6, Build date: Sep 14 2001

NoCellSelected> file create-enterprise10.ssu
:
```

6.4 Creating Script Files for Use With the Scripting Utility

The easiest way to learn how to write a script file is to create a configuration using the GUI, capture the configuration, then use the generated file as a model.

The *Scripting Utility V1.0 for Enterprise Virtual Array Reference Guide* provides descriptions of the scripting utility commands.

Note

Whenever you issue commands:

- Specified names must use the full path (`\hosts\member1`)
 - If a pathname contains a space, the entire name must be enclosed in double quotation marks (“ ”) such as (`"\Virtual Disks\bos-cluster\tru64-unix\Active"`)
-

The script file created by the `CAPTURE CONFIGURATION` command for the example configuration described in Chapter 4 and Table 4–1 is shown in Example 6–4.

Note

Each command must be on one line; there is no line continuation character or comment character.

Even though it is not supported, this example uses the slash character (/) as a line continuation character to ensure that all the text is shown.

You can use a blank line to separate portions of your script. When the commands in the script file are executed, a blank line becomes a NO-OP.

Use the `ON_ERROR` option to the `SET OPTIONS` command to determine how you want the scripting utility to react to an error condition in your script. When set to `HALT_ON_ERROR`, an error condition in the script causes the script to cease execution, but the scripting utility will not exit until you press a terminal key. This allows you to observe the error.

If you encounter an error in your script, copy the script to a new file. Edit the new script file and correct the error. Delete all the commands that executed correctly, except the initial commands to set the options, select the manager, and select the cell. The script will not function if you do not select the manager and cell. After editing the new script, use the scripting utility to execute the new script file.

Note

There is a default 10-second delay between issued commands. This can add up to a lot of time for a very large script. Setting the delay to a shorter delay time will save time. If the delay is too short and causes an error condition, and if you have set `HALT_ON_ERROR`, you will know where the error occurred. You can copy the script as previously mentioned, deleting the correctly executed commands, and reset the time delay to a longer delay. Reexecute the script after making the modifications.

Example 6–4: Script File Used to Create the Example Configuration

```
SET OPTIONS ON_ERROR=HALT_ON_ERROR COMMAND_DELAY=1
SELECT MANAGER swmaxxxx Username=xxxx Password=xxxx
SELECT CELL "enterprise10"

ADD FOLDER "\\Virtual Disks\bos-cluster" COMMENT="Folder for the BOS and TCR /
software virtual disks."

ADD HOST "\\Hosts\member1" OPERATING_SYSTEM=TRU64 WORLD_WIDE_NAME=1000-0000-C925-3B7C /
IP=127.1.2.20
SET HOST "\\Hosts\member1" ADD_WORLD_WIDE_NAME=1000-0000-C925-1EA1

ADD HOST "\\Hosts\member2" OPERATING_SYSTEM=TRU64 WORLD_WIDE_NAME=1000-0000-C925-3B7D /
IP=127.1.2.21
SET HOST "\\Hosts\member2" ADD_WORLD_WIDE_NAME=1000-0000-C927-1EA2

ADD STORAGE "\\Virtual Disks\bos-cluster\tru64-unix" GROUP="\Disk Groups\Default /
Disk Group" SIZE=2 REDUNDANCY=VRAID5 MIRRORRED_WRITEBACK READ_CACHE /
NOWRITE_PROTECT OS_UNIT_ID=1001 PREFERRED_PATH=PATH_A_BOTH
ADD LUN 1 STORAGE="\Virtual Disks\bos-cluster\tru64-unix\ACTIVE" HOST="\Hosts\member1"
ADD LUN 1 STORAGE="\Virtual Disks\bos-cluster\tru64-unix\ACTIVE" HOST="\Hosts\member2"

ADD STORAGE "\\Virtual Disks\bos-cluster\clu-root" GROUP="\Disk Groups\Default /
Disk Group" SIZE=2 REDUNDANCY=VRAID5 MIRRORRED_WRITEBACK READ_CACHE /
NOWRITE_PROTECT OS_UNIT_ID=1002 PREFERRED_PATH=PATH_B_BOTH
ADD LUN 2 STORAGE="\Virtual Disks\bos-cluster\clu-root\ACTIVE" HOST="\Hosts\member1"
ADD LUN 2 STORAGE="\Virtual Disks\bos-cluster\clu-root\ACTIVE" HOST="\Hosts\member2"

ADD STORAGE "\\Virtual Disks\bos-cluster\clu-usr" GROUP="\Disk Groups\Default /
```

Example 6–4: Script File Used to Create the Example Configuration (cont.)

```
Disk Group" SIZE=8 REDUNDANCY=VRAID5 MIRRORING_READ_CACHE /
NOWRITE_PROTECT OS_UNIT_ID=1003 PREFERRED_PATH=PATH_A_BOTH
ADD LUN 3 STORAGE="\Virtual Disks\bos-cluster\clu-usr\ACTIVE" HOST="\Hosts\member1"
ADD LUN 3 STORAGE="\Virtual Disks\bos-cluster\clu-usr\ACTIVE" HOST="\Hosts\member2"

ADD STORAGE "\Virtual Disks\bos-cluster\clu-var" GROUP="\Disk Groups\Default /
Disk Group" SIZE=34 REDUNDANCY=VRAID5 MIRRORING_READ_CACHE /
NOWRITE_PROTECT OS_UNIT_ID=1004 PREFERRED_PATH=PATH_B_BOTH
ADD LUN 4 STORAGE="\Virtual Disks\bos-cluster\clu-var\ACTIVE" HOST="\Hosts\member1"
ADD LUN 4 STORAGE="\Virtual Disks\bos-cluster\clu-var\ACTIVE" HOST="\Hosts\member2"

ADD STORAGE "\Virtual Disks\bos-cluster\member1-boot" GROUP="\Disk Groups\Default /
Disk Group" SIZE=3 REDUNDANCY=VRAID5 MIRRORING_READ_CACHE /
NOWRITE_PROTECT OS_UNIT_ID=1005 PREFERRED_PATH=PATH_A_BOTH
ADD LUN 5 STORAGE="\Virtual Disks\bos-cluster\member1-boot\ACTIVE" HOST="\Hosts\member1"
ADD LUN 5 STORAGE="\Virtual Disks\bos-cluster\member1-boot\ACTIVE" HOST="\Hosts\member2"

ADD STORAGE "\Virtual Disks\bos-cluster\member2-boot" GROUP="\Disk Groups\Default /
Disk Group" SIZE=3 REDUNDANCY=VRAID5 MIRRORING_READ_CACHE /
NOWRITE_PROTECT OS_UNIT_ID=1006 PREFERRED_PATH=PATH_B_BOTH
ADD LUN 6 STORAGE="\Virtual Disks\bos-cluster\member2-boot\ACTIVE" HOST="\Hosts\member1"
ADD LUN 6 STORAGE="\Virtual Disks\bos-cluster\member2-boot\ACTIVE" HOST="\Hosts\member2"

ADD STORAGE "\Virtual Disks\bos-cluster\clu-quorum" GROUP="\Disk Groups\Default /
Disk Group" SIZE=1 REDUNDANCY=VRAID5 MIRRORING_READ_CACHE /
NOWRITE_PROTECT OS_UNIT_ID=1007 PREFERRED_PATH=PATH_A_BOTH
ADD LUN 7 STORAGE="\Virtual Disks\bos-cluster\clu-quorum\ACTIVE" HOST="\Hosts\member1"
ADD LUN 7 STORAGE="\Virtual Disks\bos-cluster\clu-quorum\ACTIVE" HOST="\Hosts\member2"
```

6.5 Using the Scripting Utility to Delete Enterprise Configuration Information

If you need to delete or modify configuration information, you can use the GUI or the scripting utility. For example, if you replace a KGPSA, you need to delete the port WWN for the removed KGPSA and add the port WWN for the new KGPSA.

Before you use the scripting utility to delete configuration information, use the SHOW commands to determine the required format. The command format for the DELETE LUN command, shown in the *Scripting Utility V1.0 for Enterprise Virtual Array Reference Guide*, is not correct. The correct format is shown in Example 6–6. The mistake is corrected in Version 2 of the document due out in July.

Example 6–5 shows the scripting utility commands needed to remove the WWN for a KGPSA that will be removed, and to add the WWN for the new KGPSA.

Example 6–5: Using the Scripting Utility to Reset the WWN for a Replaced KGPSA

```
# sssu

SSSU version 3.0 Build 92
EMClientAPI Version 1.6, Build date: Sep 14 2001

NoCellSelected> SELECT MANAGER swmaxxxxxx Username=XXXXX Password=XXXXX
NoCellSelected> SELECT CELL Enterprise10
Enterprise10> SET HOST \Hosts\member2 DELETE_WORLD_WIDE_NAME=1000-0000-c927-1ea2
Enterprise10> SET HOST \Hosts\member2 ADD_WORLD_WIDE_NAME=1000-0000-cbad-ef10
Enterprise10>
```

Example 6–6 shows the contents of a script file which will delete the entire configuration set up in Example 6–4.

Example 6–6: Script File to Delete the Example Configuration

```
SET OPTIONS ON_ERROR=HALT_ON_ERROR
SELECT MANAGER swmaxxxx Username=xxxxx Password=xxxxx
SELECT CELL "top"
DELETE LUN \Hosts\member1\1
DELETE LUN \Hosts\member2\1
DELETE LUN \Hosts\member1\2
DELETE LUN \Hosts\member2\2
DELETE LUN \Hosts\member1\3
DELETE LUN \Hosts\member2\3
DELETE LUN \Hosts\member1\4
DELETE LUN \Hosts\member2\4
DELETE LUN \Hosts\member1\5
DELETE LUN \Hosts\member2\5
DELETE LUN \Hosts\member1\6
DELETE LUN \Hosts\member2\6
DELETE LUN \Hosts\member1\7
DELETE LUN \Hosts\member2\7
DELETE STORAGE "\\Virtual Disks\bos-cluster\tru64-unix\ACTIVE"
DELETE STORAGE "\\Virtual Disks\bos-cluster\clu-root\ACTIVE"
DELETE STORAGE "\\Virtual Disks\bos-cluster\clu-usr\ACTIVE"
DELETE STORAGE "\\Virtual Disks\bos-cluster\clu-var\ACTIVE"
DELETE STORAGE "\\Virtual Disks\bos-cluster\member1-boot\ACTIVE"
DELETE STORAGE "\\Virtual Disks\bos-cluster\member2-boot\ACTIVE"
DELETE STORAGE "\\Virtual Disks\bos-cluster\clu-quorum\ACTIVE"
DELETE HOST "\Hosts\member1"
DELETE HOST "\Hosts\member2"
DELETE FOLDER "\\Virtual Disks\bos-cluster\"
```

A

Recording Your Virtual Disk Configuration

Table A-1 lets you record your virtual disk configuration information.

Table A-1: Virtual Disk Configuration

| Filesystem | Virtual Disk Name | Size | OS Unit ID (UDID) | Device Name | dskn |
|------------------------------|-------------------|------|-------------------|-------------|------|
| Tru64 UNIX Disk | | | | | |
| Cluster Root (/) | | | | | |
| Cluster /usr | | | | | |
| Cluster /var | | | | | |
| Quorum Disk | | | | | |
| Member System 1 Boot Disk | | | | | |
| Member System 2 Boot Disk | | | | | |
| Member System 3 Boot Disk | | | | | |
| Member System 4 Boot Disk | | | | | |
| Member System 5 Boot Disk | | | | | |
| Member System 6 Boot Disk | | | | | |
| Member System 7 Boot Disk | | | | | |
| Member System 8 Boot Disk | | | | | |

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