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Hitachi Universal Storage Platform V/VM

Configuration Guide for HP Tru64® UNIX® Host Attachment

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MK-96RD654-02

Contents

Preface

Welcome to the Configuration Guide for HP Tru64® UNIX® Host Attachment. This document provides information and instructions for installing, configuring, and operating the Hitachi Universal Storage Platform V/VM storage system (USP V) in an HP Tru64 UNIX environment.

Please read this document carefully to understand how to use this product, and maintain a copy for reference purposes.

This preface includes the following information:

Note: The Storage Navigator windows shown in this document were captured on a Windows® system with the Internet Explorer web browser. The Storage Navigator windows may display differently on other operating systems and browsers. Please refer to the *Storage Navigator User's Guide* for information on other supported operating systems and browsers.

Notice: The use of the Hitachi USP V/VM storage system and all other Hitachi Data Systems products is governed by the terms of your agreement(s) with Hitachi Data Systems.

Intended Audience

This document is intended for system administrators, Hitachi Data Systems representatives, and Authorized Service Providers who are involved in installing, configuring, and operating the Hitachi Universal Storage Platform V storage system in an HP Tru64 UNIX host environment. To use this document, you should have a working knowledge of the following:

- The Hitachi Universal Storage Platform V storage system
- The HP Tru64 UNIX operating system
- The UNIX file system, including system commands and utilities
- The hardware hosting the HP Tru64 UNIX system
- The hardware used to attach the Hitachi Universal Storage Platform V to the HP Tru64 UNIX host, including fibre-channel cabling, host bus adapters (HBAs), switches, and hubs

Product Version

This document revision applies to Universal Storage Platform V microcode 60-02-3*x* and higher.

Document Revision Level

Revision	Date	Description
MK-96RD654-P	May 2007	Preliminary Release
MK-96RD654-00	September 2007	Initial Release, supersedes and replaces MK-96RD654-P
MK-96RD654-01	November 2007	MK-96RD654-01, supersedes and replaces MK-96RD654-00
MK-96RD654-0	August 2008	MK-96RD654-02, supersedes and replaces MK-96RD654-01

Changes in this Revision

- Updated Table 1-1 to describe OPEN-V support.
- Added support for USP VM.
- In Table 2-2, added host mode option 14.
- In Table 2-3, added common host mode option 13.

Source Documents for this Revision

- RSD-96rd254-02a

Document Organization

The following table provides an overview of the contents and organization of this document. Click the chapter title in the left column to go to that chapter. The first page of each chapter provides links to the sections in that chapter.

Chapter	Description
Introduction	Provides a brief overview of the Hitachi USP V, supported device types, and an installation roadmap.
Installing the USP V	Provides instructions for installing and connecting the USP V to an HP Tru64 UNIX host.
Configuring the New Disk Devices	Provides instructions for configuring the new devices on the USP V for use.
Failover and SNMP Operation	Describes how to configure the USP V/Moor failover and SNMP.
Troubleshooting	Provides information for identifying and resolving problems.
Disk Parameters for USP V Disk Types	Shows disk parameters for all the devices that can be supported.
Online Device Installation	Provides instructions for online installation of new devices.
Acronyms and Abbreviations	Defines the acronyms and abbreviations used in this document.

Referenced Documents

- *Hitachi Universal Storage Platform V Storage Navigator User's Guide*, MK-96RD621
- *Hitachi Universal Storage Platform V LUN Manager User's Guide*, MK-96RD615
- *Hitachi Universal Storage Platform V LUN Expansion (LUSE) and Virtual LVI/LUN User's Guide*, MK-96RD630
- *Hitachi Universal Storage Platform V Cross-OS File Exchange User's Guide*, MK-96RD647
- *Hitachi Dynamic Link Manager for HP Tru64 UNIX User's Guide*, MK-92DLM111

Document Conventions

The terms "Universal Storage Platform V" and "USP V" refer to all models of the Hitachi Universal Storage Platform V storage system, unless otherwise noted.

This document uses the following typographic conventions:

Convention	Description
Bold	Indicates text on a window, other than the window title, including menus, menu options, buttons, fields, and labels. Example: Click **OK**.
Italic	Indicates a variable, which is a placeholder for actual text provided by the user or system. Example: copy *source-file target-file* ***Note:*** Angled brackets (< >) are also used to indicate variables.
`screen/code`	Indicates text that is displayed on screen or entered by the user. Example: `# pairdisplay -g oradb`
< > angled	Indicates a variable, which is a placeholder for actual text provided by the user or system. Example: `# pairdisplay -g <group>` ***Note:*** Italic font is also used to indicate variables.
[ ] square	Indicates optional values. Example: [a | b] indicates that you can choose a, b, or nothing.
{ } braces	Indicates required or expected values. Example: { a | b } indicates that you must choose either a or b.
| vertical bar	Indicates that you have a choice between two or more options or arguments. Examples: dicates that you can choose a, b, or nothing. ndicates that you must choose either a or b.
underline	Indicates the default value. Example: [a | b]

This document uses the following icons to draw attention to information:

Icon	Meaning	Description
	Note	Notes call attention to important and/or additional information.
	Tip	Tips provide helpful information, guidelines, or suggestions for performing tasks more effectively.
	Caution	Cautions notify the user of adverse conditions and/or consequences (e.g., disruptive operations).
	WARNING	Warnings notify the user of severe conditions and/or consequences (e.g., destructive operations).

Convention for Storage Capacity Values

The RAID storage system calculates physical storage capacity values (e.g., disk drive capacity) based on the following values:

1 KB = 1,000 bytes
1 MB = $1{,}000^2$ bytes
1 GB = $1{,}000^3$ bytes
1 TB = $1{,}000^4$ bytes
1 PB = $1{,}000^5$ bytes

The RAID storage system calculates logical storage capacity values (e.g., logical device capacity) based on the following values:

1 KB = 1,024 bytes
1 MB = $1{,}024^2$ bytes
1 GB = $1{,}024^3$ bytes
1 TB = $1{,}024^4$ bytes
1 PB = $1{,}024^5$ bytes
1 block = 512 bytes

Getting Help

If you need to call the Hitachi Data Systems Support Center, make sure to provide as much information about the problem as possible, including:

- The circumstances surrounding the error or failure.
- The exact content of any message(s) displayed on the host system(s).
- The exact content of any message(s) displayed by Storage Navigator.
- The service information messages (SIMs), including reference codes and severity levels, displayed by Storage Navigator and/or logged at the host.

The Hitachi Data Systems customer support staff is available 24 hours/day, seven days a week. If you need technical support, please call:

- United States: (800) 446-0744
- Outside the United States: (858) 547-4526

Comments

Please send us your comments on this document. Make sure to include the document title, number, and revision. Please refer to specific section(s) and paragraph(s) whenever possible.

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Thank you! (All comments become the property of Hitachi Data Systems.)

1

Introduction

This chapter provides an overview of the USP V from Hitachi Data Systems:

- ☐ About the Hitachi Universal Storage Platform V
- ☐ Device Types
- ☐ Installation and Configuration Roadmap

About the Hitachi Universal Storage Platform V

The USP V from Hitachi Data Systems is a comprehensive and fully integrated universal storage services platform that builds on the proven technical superiority and features of Hitachi Data Systems' USP disk arrays. As an evolution of the USP solutions, the USP V combines refinements to existing technology with new functionality to deliver higher system performance, increased scalability, and greater levels of availability.

The USP V provides heterogeneous data replication and copy services between any platform at any distance, with higher performance, increased data protection, and more efficient use of network bandwidth than previously available. The result is reduced costs, simplified management, and improved data protection and disaster recovery capability. The following list summarizes the USP V's key benefits and the advantages they deliver.

- **Massive multi-protocol consolidation**. The USP V provides an integrated platform for consolidating and centralizing data, while providing access to hundreds or thousands of servers with differing connectivity requirements. USP V support for fibre channel, ESCON, and FICON - coupled with logical partitioning, virtual storage ports, and centralized management with HiCommand Software - provides the most comprehensive and flexible platform for massive consolidation of storage systems with multi-protocol requirements, while delivering the software tools to monitor, manage, and optimize the environment to ensure application quality of service.
- **Simplified storage management**. Embedded second-generation virtualization features allow multiple storage systems to be aggregated (or consolidated) into a single storage pool to reduce storage management complexities and costs. Customers can now manage the entire infrastructure from a single pane of glass, or have multiple storage administrators manage particular sets of storage resources.
- **Tiered storage foundation for data lifecycle management**. The USP V reduces costs and improves efficiency by allowing heterogeneous tiered storage to be managed from a single console and moved non-disruptively between storage tiers as the value of the data or the usage model changes. With the USP V, a tiered storage infrastructure can be built internally or in combination with externally attached storage, including FICON for IBM z/OS mainframe operating systems.
- **Investment protection**. USP V customers can enjoy a storage technology refresh while protecting their current storage system investment by attaching their legacy storage to the USP V eternally and using powerful software tools such as unique virtualization, storage partitioning, and universal replication with their legacy storage. Customers can non-disruptively migrate their data to the USP V or any other platform within the USP V's external storage pool (including FICON for IBM z/OS customers), at the appropriate time.

- **Reduced Total Cost of Ownership (TCO) with improved data availability**. A new thin provisioning software feature improves data availability while reducing storage TCO by allowing customers to allocate "virtual" disk storage based on their anticipated future needs, with less physical disk than initially required. Additional physical disks can be purchased later and installed transparently without interrupting application services.
- **Increased Return on Investment (ROI)**. The USP V increases ROI by providing investment protection and longer life for legacy storage, superior storage and server utilization, improved application quality of service, lower software licenses/costs, and simplified and centralized storage management.
- **Reduced mainframe storage costs**. The USP V lets mainframe customers exploit SATA storage either internal to the USP V or externally attached to improve data protection, cost-effectively store larger amounts DFSMS Migration Level 1 data and offload costly DFSMS mainframe processing cycles, or deploy a long-term and secure data archive solution for regulatory compliance. The USP V's virtual private storage machines are the ideal compliment to mainframe LPARs for providing workload isolation and optimum quality of service.
- **Application data mobility solutions**. The USP V is complemented by a rich suite of software solutions for managing storage across an entire heterogeneous storage pool:
  - HiCommand Tiered Storage Manager - lets customers continually adjust their storage infrastructure to meet their changing business needs.
  - HiCommand Tuning Manager and HiCommand Device Manager – let customers continually monitor and forecast their storage infrastructure needs.
  - Hitachi ShadowImage In-System Replication and Hitachi Universal Replication - deliver proven scalable data-protection for meeting the most stringent business continuance and compliance requirements of the world's largest financial institutions.
  - Hitachi Universal Replication and Hitachi ShadowImage now support more volumes and replication pairs than before. Performance has also been improved, with support added for more consistency groups spread across four USP V systems located at each site within a 2- or 3-datacenter configuration.

Note: The availability of the Hitachi USP V features and functions depends on the level of microcode installed.

Device Types

Table 1-1 describes the types of logical devices (volumes) that can be installed and configured for operation with the USP V on an HP Tru64 UNIX operating system. Table 1-2 lists the specifications for devices supported by the USP V. For information about configuring devices other than OPEN+V, contact your Hitachi Data Systems representative.

Note: Logical devices are defined to the host as SCSI disk devices, even though the interface is fibre channel.

Table 1-1 Types of Logical Devices Supported by the USP V (continues on the next page)

Device Type	Description
OPEN-x Devices	OPEN-*x* logical units (LUs) (e.g., OPEN-3, OPEN-9) are disk devices of predefined sizes. USP V supports OPEN-3, OPEN-8, OPEN-9, OPEN-E, OPEN-L, and OPEN-V devices (OPEN-V is a VLL-based volume and has no standard size). For the latest information about supported LU types, please contact your Hitachi Data Systems account team.
LUSE Devices (OPEN-x*n)	LUSE devices are combined LUs that can be from 2 to 36 times larger than standard OPEN-x LUs. Using LUN Expansion (LUSE) remote console software, you can configure these custom-size devices. LUSE devices are designated as OPEN-x*n, where x is the LU type (e.g., OPEN-9*n) and 2< n < 36). For example, a LUSE device created from 10 OPEN-3 LUs is designated as an OPEN-3*10 disk device. This lets the host combine logical devices and access the data stored on the USP V using fewer LU numbers. For more information about LUSE, see the *Hitachi Universal Storage Platform V LUN Expansion (LUSE) and Virtual LVI/LUN User's Guide* (MK-96RD630).
VLL Devices (OPEN-x VLL)	VLL devices are custom-size LUs that are smaller than standard OPEN-*x* LUs. Using Virtual LVI/LUN remote console software, you can configure VLL devices by "slicing" a single LU into several smaller LUs that best fit your application needs to improve host access to frequently used files. For more information about the Virtual LVI/LUN feature, see the *Hitachi Universal Storage Platform V LUN Expansion (LUSE) and Virtual LVI/LUN User's Guide* (MK-96RD630). The product name for the OPEN-*x* VLL devices is OPEN-*x*-CVS (CVS stands for custom volume size). The OPEN-L LU type does not support Virtual LVI/LUN.
VLL LUSE Devices (OPEN-x*n VLL)	VLL LUSE devices combine Virtual LVI/LUN devices (instead of standard OPEN-*x* LUs) into LUSE devices. Use the Virtual LVI/LUN feature to create custom-size devices, then use the LUSE feature to combine the VLL devices. You can combine from 2 to 36 VLL devices into one VLL LUSE device. For example, an OPEN-3 LUSE volume created from a0 OPEN-3 VLL volumes is designated as an OPEN-3*10 VLL device (product name OPEN-3*10-CVS).

Device Type	Description
FX Devices (3390-3A/B/C, OPEN-x-FXoto)	Using USP V's Cross-OS File Exchange (FX) feature, you can share data across mainframe, UNIX, and PC server platforms using special multiplatform volumes. The VLL feature can be applied to FX devices for maximum flexibility in volume size. For more information about FX, see the *Hitachi Cross-OS File Exchange User's Guide* (MK-96RD647), or contact your Hitachi Data Systems account team. FX devices are not SCSI disk devices, and must be installed and accessed as raw devices. UNIX/PC server hosts must use FX to access the FX devices as raw devices (no file system, no mount operation). The 3390-3B devices are write-protected from UNIX/PC server access. The USP V rejects all UNIX/PC server write operations (including fibre-channel adapters) for 3390-3B devices. Multiplatform devices are not write-protected for UNIX/PC server access. Do not execute any write operation by the fibre-channel adapters on these devices. Do not create a partition or file system on these devices. This will overwrite any data on the FX device and prevent the FX software from accessing the device.

Table 1-2 USP V Device Specifications (continues on the next page)

Device Type (Note 1)	Category (Note 2)	Vendor Name	Product Name (Note 3)	# of Blocks (512-byte blk)	Sector Size (bytes)	# of Cylinders	# of Heads	# of Sectors per Track	Capacity MB (Note 4)
OPEN-3	SCSI disk	HITACHI	OPEN-3	4806720	512	3338	15	96	2347
OPEN-8	SCSI disk	HITACHI	OPEN-8	14351040	512	9966	15	96	7007
OPEN-9	SCSI disk	HITACHI	OPEN-9	14423040	512	10016	15	96	7042
OPEN-E	SCSI disk	HITACHI	OPEN-E	28452960	512	19759	15	96	13893
OPEN-L	SCSI disk	HITACHI	OPEN-L	71192160	512	49439	15	96	34761
OPEN-3*n	SCSI disk	HITACHI	OPEN-3*n	4806720*n	512	3338*n	15	96	2347*n
OPEN-8*n	SCSI disk	HITACHI	OPEN-8*n	14351040*n	512	9966*n	15	96	7007*n
OPEN-9*n	SCSI disk	HITACHI	OPEN-9*n	14423040*n	512	10016*n	15	96	7042*n
OPEN-E*n	SCSI disk	HITACHI	OPEN-E*n	28452960*n	512	19759*n	15	96	13893*n
OPEN-L*n	SCSI disk	HITACHI	OPEN-L*n	71192160*n	512	49439*n	15	96	34761*n
OPEN-3 VLL	SCSI disk	HITACHI	OPEN-3-CVS	***Note 5***	512	***Note 6***	15	96	***Note 7***
OPEN-8 VLL	SCSI disk	HITACHI	OPEN-8-CVS	***Note 5***	512	***Note 6***	15	96	***Note 7***
OPEN-9 VLL	SCSI disk	HITACHI	OPEN-9-CVS	***Note 5***	512	***Note 6***	15	96	***Note 7***
OPEN-E VLL	SCSI disk	HITACHI	OPEN-E-CVS	***Note 5***	512	***Note 6***	15	96	***Note 7***
OPEN-V VLL	SCSI disk	HITACHI	OPEN-V	***Note 5***	512	***Note 6***	15	128	***Note 7***
OPEN-3*n VLL	SCSI disk	HITACHI	OPEN-3*n-CVS	***Note 5***	512	***Note 6***	15	96	***Note 7***
OPEN-8*n VLL	SCSI disk	HITACHI	OPEN-8*n-CVS	***Note 5***	512	***Note 6***	15	96	***Note 7***
OPEN-9*n VLL	SCSI disk	HITACHI	OPEN-9*n-CVS	***Note 5***	512	***Note 6***	15	96	***Note 7***
OPEN-E*n VLL	SCSI disk	HITACHI	OPEN-E*n-CVS	***Note 5***	512	***Note 6***	15	96	***Note 7***
OPEN-V*n VLL	SCSI disk	HITACHI	OPEN-V*n	***Note 5***	512	***Note 6***	15	128	***Note 7***
3390-3A	FX otm/mto	HITACHI	3390-3A	5820300	512	3345	15	116	2844
3390-3B	FXmto	HITACHI	3390-3B	5816820	512	3343	15	116	2842

Table 1-2 USP V Device Specifications (continued)

Device Type (Note 1)	Category (Note 2)	Vendor Name	Product Name (Note 3)	# of Blocks (512-byte blk)	Sector Size (bytes)	# of Cylinders	# of Heads	# of Sectors per Track	Capacity MB (Note 4)
3390-3C	FXotm	HITACHI	OP-C-3390-3C	5820300	512	3345	15	116	2844
FX OPEN-3	FXoto	HITACHI	OPEN-3	4806720	512	3338	15	96	2347
3390-3A VLL	FX otm/mto	HITACHI	3390-3A-CVS	***Note 5***	512	***Note 6***	15	116	***Note 7***
3390-3B VLL	FXmto	HITACHI	3390-3B-CVS	***Note 5***	512	***Note 6***	15	116	***Note 7***
3390-3C VLL	FXotm	HITACHI	OP-C-3390-3C-CVS	***Note 5***	512	***Note 6***	15	116	***Note 7***
FX OPEN-3 VLL	FXoto	HITACHI	OPEN-3-CVS	***Note 5***	512	***Note 6***	15	96	***Note 7***

Note 1: The availability of a specific USP V device type depends on the level of microcode installed on the USP V system.

Note 2: The category of a device (SCSI disk or raw) determines its volume usage. Table 1-3 shows the volume usage for SCSI disk devices and raw devices. The SCSI disk devices (OPEN-*x*, VLL, LUSE, VLL LUSE) are usually formatted with partitions and file systems for HP Tru64 UNIX operations. The multiplatform devices (e.g., 3390-3A/B/C) must be installed as raw devices and can only be accessed using FX. Do not create a file system on any device used for FX operations.

Table 1-3 Volume Usage for Device Categories

Category	Device Type	Volume Usage
SCSI Disk	OPEN-x, OPEN-x VLL, OPEN-x*n LUSE, OPEN-x*n VLL LUSE (SCSI disk devices can also be used as raw devices. For example, some database applications use raw devices.	File System
FX	3390-3A/B/C 3390-3A/B/C VLL OPEN-x for FXoto, OPEN-x VLL for FXoto	Raw Device

Note 3: The USP V command device (used for Hitachi Command Control Interface operations) is distinguished by **-CM** on the product name (e.g., OPEN-3-CM, OPEN-3-CVS-CM). The product name for OPEN-*x* VLL devices is OPEN-*x* **CVS** (CVS = custom volume size).

Note 4: The device capacity can sometimes be changed by the BIOS or HBA. Different capacities may be due to variations such as 1 MB = 1000^2 or 1024^2 bytes.

Note 5: The number of blocks for a VLL volume is calculated as follows:

# of blocks = (# of data cylinders) × (# of heads) × (# of sectors per track)

Example 1: For an OPEN-3 VLL volume with capacity = 37 MB:

# of blocks = (53 cylinders – see Note 6) × (15 heads) × (96 sectors per track) = 76320

Example 2: For an OPEN-V VLL volume with capacity = 49 MB:

# of blocks = (53 cylinders – see Note 6) × (15 heads) × (128 sectors per track) = 101760

Note 6: The number of data cylinders for a VLL volume is calculated as follows (↑**...**↑ means the value should be rounded up to the next integer):

OPEN-3/8/9/E: The number of data cylinders for an OPEN-3/8/9/E VLL volume =

# of cylinders = ↑ (capacity (MB) specified by user) × 1024/720 ↑

Example: For an OPEN-3 VLL volume with capacity = 37 MB:

# of cylinders = ↑37 × 1024/720↑ = ↑52.62↑ (rounded up to next integer) = 53 cylinders

OPEN-V: The number of data cylinders for an OPEN-V VLL volume =

# of cylinders = ↑ (capacity (MB) specified by user) × 16/15 ↑

Example: For an OPEN-V VLL volume with capacity = 49 MB:

# of cylinders = ↑49 × 16/15↑ = ↑52.26↑ (rounded up to next integer) = 53 cylinders

OPEN-3/8/9/E: The number of data cylinders for an OPEN-3/8/9/E VLL LUSE volume =

# of cylinders = ↑ (capacity (MB) specified by user) × 1024/720 ↑ × n

Example: For an OPEN-3 VLL LUSE volume with capacity = 37 MB and n = 4

# of cylinders = ↑37 × 1024/720↑ × 4 = ↑52.62↑× 4 = 53 × 4 = 212

OPEN-V: The number of data cylinders for an OPEN-V VLL LUSE volume =

# of cylinders = ↑ (capacity (MB) specified by user) × 16/15 ↑ × n

Example: For an OPEN-V VLL LUSE volume with capacity = 49 MB and n = 4

# of cylinders = ↑49 × 16/15↑ × 4 = ↑52.26↑× 4 = 53 × 4 = 212

The number of data cylinders for a 3390-3A/C VLL volume =

# of cylinders = (number of cylinders specified by user) + 9

The number of data cylinders for a 3390-3B VLL volume =

# of cylinders = (number of cylinders specified by user) + 7

Note 7: The size of an OPEN-3/8/9/E VLL volume is specified by capacity in MB, not number of cylinders. The size of an OPEN-V VLL volume can be specified by capacity in MB or number of cylinders. The user specifies the volume size using the USP V Virtual LVI/LUN software.

Installation and Configuration Roadmap

The steps in Table 1-4 and Figure 1-1 outline the general process you follow to install and configure the USP V on an HP Tru64 UNIX operating system.

Table 1-4 Installation and Configuration Roadmap

	Task
1.	Verify that the system on which you are installing the USP V meets the minimum requirements for this release.
2.	Prepare the USP V for the installation.
3.	Prepare the fibre-channel HBAs for the installation.
4.	Connect the USP V to an HP Tru64 UNIX host.
5.	Verify recognition of the new devices, set up boot devices, and verify new device recognition.
6.	Verify device files, enable command tag queuing, and set the I/O timeout value.
7.	Register the disk types and write partition labels.
8.	Create file systems and mount directories, mount and verify the file systems, and set and verify auto-mount parameters.

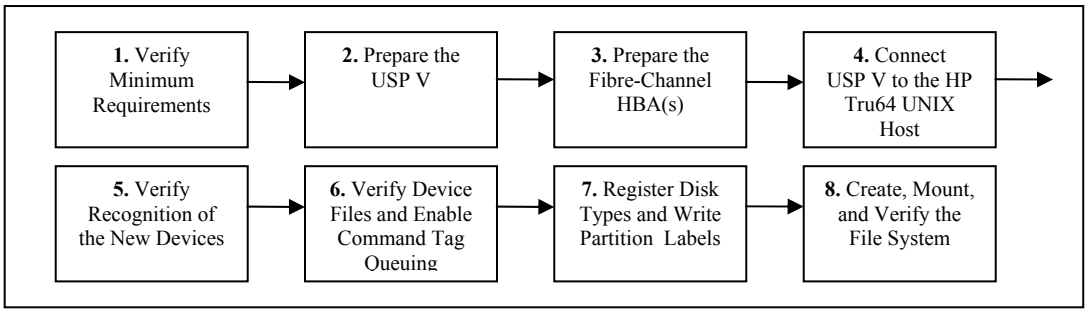

Figure 1-1 Installation and Configuration

2

Installing the USP V

This chapter describes how to install the USP V on an HP Tru64 UNIX operating system:

Installation and Configuration Checklist

Table 2-1 is a checklist for installing and configuring the USP V on an HP Tru64 UNIX operating system. The two columns on the left indicate requirements to be met, tasks to be completed, and information to be obtained before you perform the installation. Use the column on the right to confirm that you have the required minimum requirements and completed the task. You can also write any notes about a requirement.

Table 2-1 Installation and Configuration Checklist

Installation Requirements	Description	Requirements Confirmed?
Hitachi USP V, all-open or multiplatform configuration	The availability of features and devices depends on the level of microcode installed on the USP V. Use LUN Manager software to configure the fibre-channel ports. If this feature is not installed, contact your Hitachi Data Systems account team.	
HP Tru64 UNIX operating system	Contact HP to be sure the most current OS patches are installed.	
Fibre-channel HBAs	The USP V supports fibre-channel HBAs equipped as follows: ▪ 4 Gbps fibre-channel interface, including shortwave non-OFC (open fibre control) optical interface and multimode optical cables with LC connectors. ▪ 2 Gbps fibre-channel interface, including shortwave non-OFC (open fibre control) optical interface and multimode optical cables with LC connectors. ▪ 1 Gbps fibre-channel interface, including shortwave non-OFC optical interface and multimode optical cables with SC connectors. If a switch or HBA with a 1Gbps transfer rate is used, configure the device to use a fixed 1Gbps setting instead of Auto Negotiation. Otherwise, it may prevent a connection from being established. Do not connect OFC-type fibre-channel interfaces to the USP V. For information about supported fibre-channel HBAs, optical cables, hubs, and fabric switches, contact your Hitachi Data Systems account team.	
Fibre-channel utilities and tools	Refer to the documentation for your fibre-channel HBA for information about installing the utilities and tools for your adapter.	
Fibre-channel drivers	Do not install/load the driver(s) yet. When instructed in this guide to install the drives for your fibre-channel HBA, refer to the documentation for your adapter.	

Preparing for the USP V Installation

The following sections describe preinstallation considerations to follow before installing the USP V.

Hardware Installation Considerations

The Hitachi Data Systems representative performs the hardware installation by following the precautions and procedures in the USP V Maintenance Manual. USP V comes with all the hardware and cabling required for the installation.

Hardware installation activities include:

- Assembling all hardware and cabling
- Installing and formatting the logical devices (LDEVs). Be sure to obtain the desired LDEV configuration information from the user, including the desired number of OPEN-*x*, LUSE, VLL, VLL LUSE, and multiplatform (FX) devices.
- Installing the fibre-channel HBAs and cabling. The total fibre cable length attached to each fibre-channel adapter must not exceed 500 meters (1,640 feet).
  - Do not connect any OFC-type connectors to the USP V.
  - Do not connect/disconnect fibre-channel cabling that is being actively used for I/O. This can cause the HP Tru64 UNIX system to hang.
  - Always confirm that the devices on the fibre cable are offline before connecting/disconnecting the fibre cable.
- Configuring the fibre port topology. The fibre topology parameters for each USP V fibre-channel port depend on the type of device to which the port is connected, and the type of port. Determine the topology parameters supported by the device, and set your topology accordingly (see Configuring the USP V Fibre-Channel Ports).

Before starting the installation, check all specifications to ensure proper installation and configuration.

LUN Manager Software Installation

LUN Manager software is used to configure USP V's fibre-channel ports. The user or Hitachi Data Systems representative installs the LUN Manager software. For instructions about installing the LUN Manager software, see the *Hitachi Universal Storage Platform V Storage Navigator User's Guide* (MK-96RD621). For more information about LUN Manager, see the *Hitachi Universal Storage Platform V LUN Manager User's Guide* (MK-96RD615).

Note: If the LUN Manager feature is not installed, the Hitachi Data Systems representative can configure fibre-channel ports for you. Contact your Hitachi Data Systems account team.

Setting the Host Mode

The USP V has host modes that the storage administrator must set for all new installations (newly connected ports) to HP Tru64 UNIX hosts.

- The required host mode for HP Tru64 UNIX is: **07**

Do not select a host mode other than **07** for HP Tru64 UNIX.

You can use either the LUN Manager software (Storage Navigator) or the HiCommand® Device Manager software to set the host mode. Figure 2-1 shows the Add New Host Group panel from LUN Manager. For more information about using LUN Manager, see the *Hitachi Universal Storage Platform V LUN Manager User's Guide* (MK-96RD615).

WARNING: Changing host modes on USP V systems that are already installed and configured is disruptive and requires the server to be rebooted.

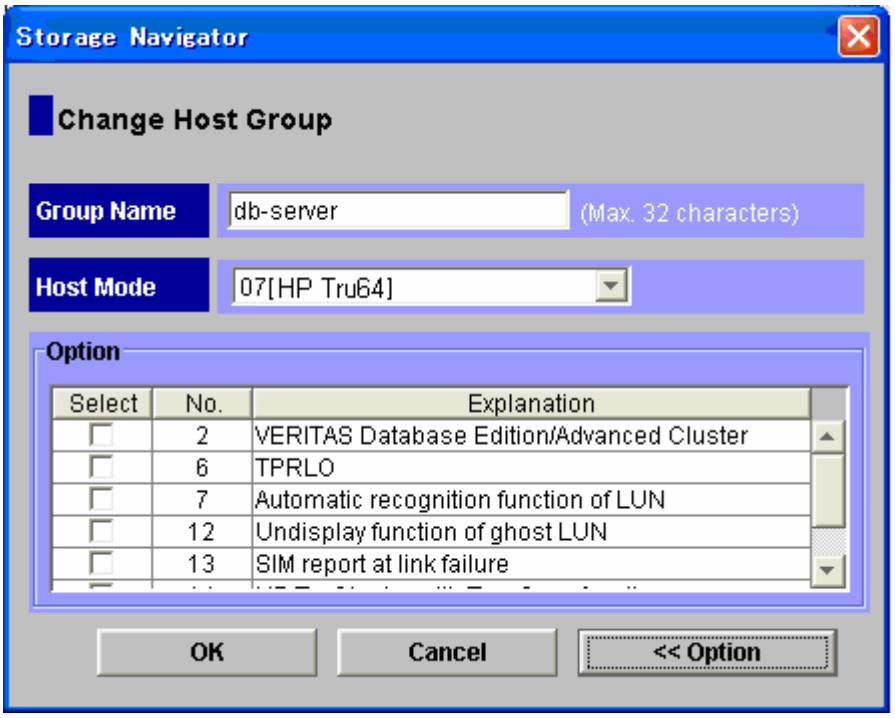

Figure 2-1 Example of Setting the Host Mode

Setting the Host Mode Options

When each new host group is added, the storage administrator must be sure that all host mode options are set for all host groups connected to HP Tru64 UNIX hosts.

- The required host mode option for Tru64 UNIX is: **14**

Select host mode option **14** when the conditions in Table 2-2 are met. Alternatively, common host mode option **13** can be selected (see Table 2-3).

WARNING: Changing host mode options on USP V systems that are already installed and configured is disruptive and requires the server to be rebooted.

Table 2-2 Host Mode Option for HP Tru64 UNIX

No.	Host Mode Option	Select if the Following Conditions are Met	Remarks
14	For HP TruCluster	Apply this when you want to use TruCluster to set a cluster to each of P-VOL and S-VOL for TrueCopy or Universal Replicator.	Mandatory

Table 2-3 Common Host Mode Options for the USP V

No.	Host Mode Option	Select if the Following Conditions are Met	Remarks
13	SIM report at link failure	When you want SIM notification when the number of link failures detected between ports exceeds the threshold.	Optional

You can use either the LUN Manager software (Storage Navigator) or the HiCommand® Device Manager software to set the host mode options. For more information about using LUN Manager, see the *Hitachi Universal Storage Platform V LUN Manager User's Guide* (MK-96RD615).

Configuring the USP V Fibre-Channel Ports

Use LUN Manager software to configure the USP V fibre-channel ports with the appropriate fibre parameters. You select the appropriate settings for each USP V fibre-channel port based on the device to which the port is connected: Determine the topology parameters supported by the device, and set your topology accordingly.

Figure 2-2 shows the LUN Manager panel for defining port parameters, and Table 2-4 explains the panel settings. For more information, see the *Hitachi Universal Storage Platform V LUN Manager User's Guide* (MK-96RD615).

Table 2-4 Fibre Parameter Settings for the USP V

Fabric	Connection	Provides
Enable	FC-AL	*Not supported*
Enable	Point-to-Point	F-port (fabric port)
Disable	FC-AL	NL-port (private arbitrated loop)
Disable	Point-to-Point	*Not supported*

Note: The USP V supports up to 2048 LUs per fibre-channel port.

Note: If you plan to connect different types of servers to the USP V via the same fabric switch, use the zoning function of the fabric switch.

Note: Contact Hitachi Data Systems for information about port topology configurations supported by HBA/switch combinations. Not all switches support F-port connection.

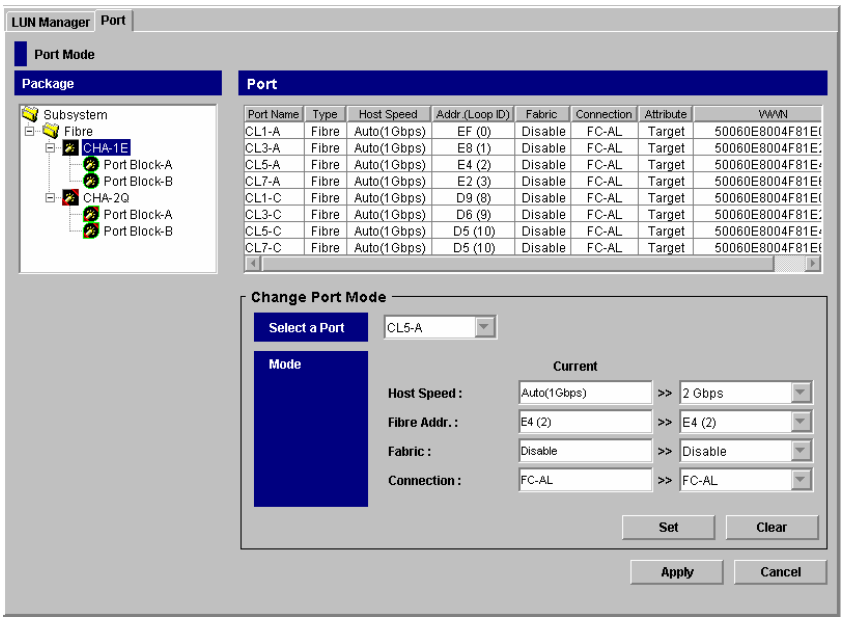

Figure 2-2 Setting the Fibre-Channel Port Parameters

Port Address Considerations for Fabric Environments

In fabric environments, port addresses are assigned automatically by fabric switch port number and are not controlled by the USP V port settings. In arbitrated loop environments, the port addresses are set by entering an AL-PA (arbitrated-loop physical address, or loop ID).

Table 2-5 shows the available USP V AL-PA values ranging from **01** to **EF**. Fibre-channel protocol uses the AL-PAs to communicate on the fibre-channel link, but the software driver of the platform host adapter translates the AL-PA value assigned to the USP V port to a SCSI TID. See Appendix A for a description of the AL-PA-to-TID translation.

Note: For a dual-path configuration, configure at least two ports on the USP V (for example, **1A** and **2A**). For a two-node HP Tru64 UNIX cluster, configure at least four ports (for example, one host will use ports **1A** and **2A**, while the other will use ports **1B** and **2B**).

Table 2-5 Available AL-PA Values

EF	CD	B2	98	72	55	3A	25
E8	CC	B1	97	71	54	39	23
E4	CB	AE	90	6E	53	36	1F
E2	CA	AD	8F	6D	52	35	1E
E1	C9	AC	88	6C	51	34	1D
E0	C7	AB	84	6B	4E	33	1B
DC	C6	AA	82	6A	4D	32	18
DA	C5	A9	81	69	4C	31	17
D9	C3	A7	80	67	4B	2E	10
D6	BC	A6	7C	66	4A	2D	0F
D5	BA	A5	7A	65	49	2C	08
D4	B9	A3	79	63	47	2B	04
D3	B6	9F	76	5C	46	2A	02
D2	B5	9E	75	5A	45	29	01
D1	B4	9D	74	59	43	27	
CE	B3	9B	73	56	3C	26	

Configuring the Host Fibre-Channel HBA(s)

Configure the fibre-channel HBA(s) connected to USP V. The HBAs have many configuration options. For more information, refer to the documentation for your fibre-channel HBA(s).

Connecting the USP V to the HP Tru64 UNIX Host

After you prepare the USP V hardware and software and fibre-channel HBA(s), connect the USP V to the HP Tru64 UNIX system. The USP V comes with all the hardware and cabling required for connection to the host system(s).

Table 2-6 summarizes the steps for connecting USP V to the HP Tru64 UNIX system host. Some steps are performed by the Hitachi Data Systems representative, while others are performed by the user.

Table 2-6 Steps for Connecting USP V to an HP Tru64 UNIX Host

	Activity	Performed by	Description
1.	Verify system installation	Hitachi Data Systems representative	Confirm that the status of the fibre-channel HBA(s) and LDEVs is NORMAL.
2.	Shut down the HP Tru64 UNIX system	User	Power off the HP Tru64 UNIX system before connecting the USP V ▪ Shut down the HP Tru64 UNIX system. ▪ When shutdown is complete, power off the HP Tru64 UNIX display. ▪ Power off all peripheral devices except for the USP V. ▪ Power off the host system. You are now ready to connect the USP V.
3.	Connect the USP V	Hitachi Data Systems representative	Install fibre-channel cables between the USP V and the HP Tru64 UNIX system. Follow all precautions and procedures in the USP V Maintenance Manual. Check all specifications to ensure proper installation and configuration.
4.	Power on the HP Tru64 UNIX system	User	Power on the HP Tru64 UNIX system after connecting the USP V: ▪ Power on the HP Tru64 UNIX system display. ▪ Power on all peripheral devices. The USP V should be on, the fibre-channel ports should be configured, and the driver configuration file and system configuration file should be edited. If the fibre ports are configured or configuration files edited after the HP Tru64 UNIX system is powered on, restart the system to have the new devices recognized. ▪ Confirm the ready status of all peripheral devices, including the USP V. ▪ Power on the HP Tru64 UNIX system.

Verifying Recognition of New Devices

After connecting the USP V system to the Tru64 UNIX system, verify that the HP AlphaServer™ console recognizes the new devices. The devices must be installed and formatted and the fibre-channel ports configured before the host system is powered on. Otherwise, the user must shut down and restart the system to allow the system to recognize the new devices.

To verify that the HP AlphaServer console recognizes the new devices on the USP V system:

1. Enter the **init** command at the console prompt (usually `P00>>>`). On some HP AlphaServer™ models, you may have to enter the command **set mode diag** instead.
2. Enter the **wwidmgr -show wwid** command to verify that the USP V devices are present.
3. Enter the **init** command to reset the console. Figure 2-3 shows an example.

```
P00>>>set mode diag
Console is in diagnostic mode

P00>>>wwidmgr -show wwid
polling kgpsa0 (KGPSA-C) slot 2, bus 0 PCI, hose 1
kgpsaa0.0.0.2.1    PGA0        WWN 2000-0000-c92f-2953
polling kgpsa1 (KGPSA-C) slot 3, bus 0 PCI, hose 0
kgpsab0.0.0.3.0    PGB0        WWN 2000-0000-c92f-293e
[0] UDID:544 WWID:01000010:6006-0e80-0427-2e00-0009-0000-272e-0220 (ev:none)
[1] UDID:545 WWID:01000010:6006-0e80-0427-2e00-0009-0000-272e-0221 (ev:none)
[2] UDID:546 WWID:01000010:6006-0e80-0427-2e00-0009-0000-272e-0222 (ev:none)
[3] UDID:547 WWID:01000010:6006-0e80-0427-2e00-0009-0000-272e-0223 (ev:none)
[4] UDID:548 WWID:01000010:6006-0e80-0427-2e00-0009-0000-272e-0224 (ev:none)
[5] UDID:549 WWID:01000010:6006-0e80-0427-2e00-0009-0000-272e-0225 (ev:none)
[6] UDID:550 WWID:01000010:6006-0e80-0427-2e00-0009-0000-272e-0226 (ev:none)
[7] UDID:551 WWID:01000010:6006-0e80-0427-2e00-0009-0000-272e-0227 (ev:none)
```

Figure 2-3 Example of Verifying New Devices

Setting Up Boot Devices

For the Tru64 UNIX system to use USP V devices at boot time, the user must make the devices visible to the Tru64 UNIX system. This is done by using either the **wwidmgr –quickset** or **wwidmgr –set** commands. Up to four devices can be made visible to Tru64 UNIX at boot time. The procedure for using the **wwidmgr –quickset** command is described below.

In this example:

- The **wwidmgr –quickset –udid** command sets host LUNs 0 and 1.
- The **wwidmgr –quickset –item** command sets host LUNs 2 and 3.
- The **wwidmgr –show wwid** command verifies that the boot LUNs are set.
- The **wwidmgr –show reachability** command verifies that the boot LUNs are visible on two paths.

Note: The udid of the ldevs is equal to the decimal value of the ldev number (i.e., ldev 02:20 receives a udid of 544). The only exception is ldev 00:00, which receives the udid of –1. This is not a problem, but if you want to set ldev 00:00 as a boot device, you must use the **wwidmgr –quickset –item** command.

Verifying New Device Recognition

After connecting the USP V system to the Tru64 UNIX system, verify that the system recognizes the new devices. The devices must be installed and formatted and the fibre-channel ports configured before the host system is powered on. If not, the user must shut down and restart the system to allow the system to recognize the new devices.

To verify that the Tru64 UNIX system recognizes the new devices on the USP V system:

1. If desired, you can verify new USP V device recognition before booting the Tru64 UNIX system using the **show device |more** command (see Figure 2-4).
2. Boot the Tru64 UNIX system as usual (e.g., **boot**).
3. Log in to the Tru64 UNIX system as **root**.
4. Display the device information using either the **scu show edt** command (see Figure 2-5) or the **hwmgr –show scsi** command (see Figure 2-6). The **hwmgr** command is available only on Tru64 UNIX 5.x systems. Be sure that all new USP V devices including OPEN-*x*, LUSE, and VLL are recognized by the Tru64 UNIX system.
5. Record the device file names in your SCSI Device Information Worksheet (see Table 2-7). You will need the device file name information when you configure the new devices.

```
P00>>>show dev
polling ncr0 (NCR 53C810) slot 1, bus 0 PCI, hose 1   SCSI Bus ID 7
dka500.5.0.1.1     DKA500                  RRD46  1337
mka600.6.0.1.1     MKA600                  TLZ09  0173
polling kgpsa0 (KGPSA-C) slot 2, bus 0 PCI, hose 1
kgpsaa0.0.0.2.1    PGA0        WWN 2000-0000-c92f-2953
dga544.1002.0.2.1  $1$DGA544               HITACHI OPEN-3  5002
dga545.1002.0.2.1  $1$DGA545               HITACHI OPEN-3  5002
dga1695.1002.0.2.1 $1$DGA1695              HITACHI OPEN-3  5002
dga18014.1002.0.2.1 $1$DGA18014             HITACHI OPEN-3  5002
polling isp0 (QLogic ISP10X0) slot 3, bus 0 PCI, hose 1   SCSI Bus ID 7
dkb100.1.0.3.1     DKB100                  RZ1CB-CA  LYJ0
dkb300.3.0.3.1     DKB300                  RZ1CB-CA  LYJ0
dkb500.5.0.3.1     DKB500                  RZ1CB-CA  LYJ0
polling floppy0 (FLOPPY) PCEB - XBUS hose 0
dva0.0.0.1000.0    DVA0                     RX23
polling kgpsa1 (KGPSA-C) slot 3, bus 0 PCI, hose 0
kgpsab0.0.0.3.0    PGB0        WWN 2000-0000-c92f-293e
dgb544.1001.0.3.0  $1$DGA544               HITACHI OPEN-3  5002
dgb545.1001.0.3.0  $1$DGA545               HITACHI OPEN-3  5002
dgb1695.1001.0.3.0 $1$DGA1695              HITACHI OPEN-3  5002
dgb18014.1001.0.3.0 $1$DGA18014             HITACHI OPEN-3  5002
polling tulip0 (DECchip 21140-AA) slot 4, bus 0 PCI, hose 1
ewa0.0.0.4.1       00-00-F8-08-16-60     Fast
polling ei0 (Intel 8255x Ethernet) slot 4, bus 2 PCI, hose 1
eia0.0.0.2004.1    00-90-27-E8-57-E6     Twi
```

Figure 2-4 Verifying USP V Device Recognition (boot prompt)

Note: The sample screen in Figure 2-4 may not be exactly the same for all Tru64 UNIX systems.

```
# scu show edt
CAM Equipment Device Table (EDT) Information:
    Bus/Target/Lun Device Type  ANSI  Vendor ID    Product ID     Revision N/W
    -------------- ----------- ------ --------- ---------------- -------- ---
     0     4     0   CD-ROM      SCSI-2 DEC       RRD46    (C) DEC    1337    N
     0     5     0   Sequential  SCSI-2 DEC       TLZ09      (C)DEC   0173    N
     1     1     0   Direct      SCSI-2 DEC       HSG80               V85S    W
     1     1     1   Direct      SCSI-2 DEC       HSG80               V85S    W
     1     1     2   Direct      SCSI-2 DEC       HSG80               V85S    W
     1     1     3   Direct      SCSI-2 DEC       HSG80               V85S    W
     2     1     0   Direct      SCSI-2 DEC       HSG80               V85S    W
     2     1     1   Direct      SCSI-2 DEC       HSG80               V85S    W
     2     1     2   Direct      SCSI-2 DEC       HSG80               V85S    W
     2     1     3   Direct      SCSI-2 DEC       HSG80               V85S    W
     3     0     0   Direct      SCSI-2 DEC       RZ1CB-CS  (C)  DEC   0844    W
```

Figure 2-5 Verifying USP V Device Recognition (Tru64 UNIX 4.x or 5.x prompt)

```
# hwmgr -show scsi | more
      SCSI             DEVICE    DEVICE  DRIVER NUM  DEVICE FIRST
 HWID:  DEVICEID HOSTNAME   TYPE      SUBTYPE OWNER  PATH FILE   VALID PATH
--------------------------------------------------------------------------
   0:  5      alpha1    processor none   0     1    (null)
  58:  0      alpha1    cdrom     none   0     1    cdrom0 [0/5/0]
  59:  2      alpha1    disk      none   2     1    dsk0   [2/1/0]
  60:  3      alpha1    disk      none   0     1    dsk1   [2/3/0]
  61:  4      alpha1    disk      none   0     1    dsk2   [2/5/0]
  62:  1      alpha1    tape      none   0     1    tape0  [0/6/0]
 230:  170    alpha1    disk      none   0     2    dsk166 [3/0/0]
 231:  171    alpha1    disk      none   0     2    dsk167 [3/0/1]
 232:  172    alpha1    disk      none   0     2    dsk168 [3/0/2]
 233:  173    alpha1    disk      none   0     2    dsk169 [3/0/3]
 234:  174    alpha1    disk      none   0     2    dsk170 [3/0/4]
 235:  175    alpha1    disk      none   0     2    dsk171 [3/0/5]
 236:  176    alpha1    disk      none   0     2    dsk172 [3/0/6]
 237:  177    alpha1    disk      none   0     2    dsk173 [3/0/7]
```

Figure 2-6 Verifying USP Device Recognition (Tru64 UNIX 5.x prompt)

Table 2-7 Sample SCSI Device Information Worksheet

LDEV (CU:LDEV)	LU Type	LUSE (*n)	VLL (MB)	Device Name	Bus Number	Path
0:00						TID:____ LUN:____
0:01						TID:____ LUN:____
0:02						TID:____ LUN:____
0:03						TID:____ LUN:____
0:04						TID:____ LUN:____
0:05						TID:____ LUN:____
0:06						TID:____ LUN:____
0:07						TID:____ LUN:____
0:08						TID:____ LUN:____
0:09						TID:____ LUN:____
0:0a						TID:____ LUN:____
0:0b						TID:____ LUN:____
0:0c						TID:____ LUN:____
0:0d						TID:____ LUN:____
0:0e						TID:____ LUN:____
0:0f						TID:____ LUN:____
0:10						TID:____ LUN:____
and so on…						

3

Configuring the New Disk Devices

This chapter describes how to configure the new USP V disk devices that you attached to the HP Tru64 UNIX system host in the previous chapter. The topics in this chapter are:

Note: The USP V logical devices are defined to the host as SCSI disk devices, even though the interface is fibre channel.

For information about configuring USP V for failover and SNMP, see Failover and SNMP Configuration.

For information about disk parameters for all the devices that can be supported, see Appendix A.

For information about online device installation, see Appendix B.

Verifying the Device Files

The Tru64 UNIX system should create the device files for all new devices automatically during startup. Please be sure that these files were created. When the device files are created, the system automatically reads the disk partitioning information directly from the disks.

The Tru64 UNIX device file naming convention is different than the device file naming conventions used by other UNIX-based platforms. Tru64 UNIX 4.x systems and some 5.x systems use the legacy device file naming convention. The names have the form /dev/rrzXYYZ for character-type devices and /dev/rzXYYZ for block-type devices, where:

- X = LUN number = a through g = LUN 1 through LUN 7 (LUN 0 is represented by no letter)
- YY = device number = 8*(bus number) + scsi id
- Z = partition = a through h

For example: **/dev/rrz49c** = is the disk on bus 6, scsi id 1, LUN 0, and partition c. This is the character-type device.

/dev/rzb50a is the disk on bus 6, scsi id 2, LUN 1, and partition a. This is the block-type device.

On Tru64 UNIX 5.x systems, the character-type device file name has the form /dev/rdisk/**dskXY** (/dev/disk/**dskXY** for block-type device file name), where:

- X = device instance number (assigned by the operating system)
- Y = partition = a through h

For example:**/dev/rdisk/dsk8a** = disk 8 partition is a character-type device
/dev/disk/dsk8a = disk 8 partition is a block-type device

Tru64 UNIX 5.x systems do support the legacy device file naming convention.

To verify that the device files for the new USP V devices were created successfully, perform the following procedure:

1. Display the character-type device files (see Figure 3-1). The device files are listed by bus number: **file /dev/rdisk/dsk* | grep OPEN**
2. Be sure that character-type device files were generated for each new USP V device. The example in Figure 3-2 shows that all 8 of the LUNS have character-type device files associated with them.
3. Display the block-type device files: **file /dev/disk/dsk***. On Tru64 UNIX 5.x systems you can also use **hwmgr –view devices**. The example in Figure 3-1 shows the output of the **file** command for one LUN. The example in Figure 3-3 shows the output of the **hwmgr** command.
4. Be sure that block-type device files were generated for each new USP V device.

```
# file /dev/rdisk/dsk* | grep OPEN
/dev/rdisk/dsk166a:     character special (19/2712) SCSI #3 "OPEN-3" disk #18 (SCSI ID #0) (SCSI LUN #0)
/dev/rdisk/dsk166b:     character special (19/2714) SCSI #3 "OPEN-3" disk #18 (SCSI ID #0) (SCSI LUN #0)
/dev/rdisk/dsk166c:     character special (19/2716) SCSI #3 "OPEN-3" disk #18 (SCSI ID #0) (SCSI LUN #0)
/dev/rdisk/dsk166d:     character special (19/2718) SCSI #3 "OPEN-3" disk #18 (SCSI ID #0) (SCSI LUN #0)
/dev/rdisk/dsk166e:     character special (19/2720) SCSI #3 "OPEN-3" disk #18 (SCSI ID #0) (SCSI LUN #0)
/dev/rdisk/dsk166f:     character special (19/2722) SCSI #3 "OPEN-3" disk #18 (SCSI ID #0) (SCSI LUN #0)
/dev/rdisk/dsk166g:     character special (19/2724) SCSI #3 "OPEN-3" disk #18 (SCSI ID #0) (SCSI LUN #0)
/dev/rdisk/dsk166h:     character special (19/2726) SCSI #3 "OPEN-3" disk #18 (SCSI ID #0) (SCSI LUN #0)
/dev/rdisk/dsk167a:     character special (19/2728) SCSI #3 "OPEN-3" disk #19 (SCSI ID #0) (SCSI LUN #1)
/dev/rdisk/dsk167b:     character special (19/2730) SCSI #3 "OPEN-3" disk #19 (SCSI ID #0) (SCSI LUN #1)
/dev/rdisk/dsk167c:     character special (19/2732) SCSI #3 "OPEN-3" disk #19 (SCSI ID #0) (SCSI LUN #1)
/dev/rdisk/dsk167d:     character special (19/2734) SCSI #3 "OPEN-3" disk #19 (SCSI ID #0) (SCSI LUN #1)
/dev/rdisk/dsk167e:     character special (19/2736) SCSI #3 "OPEN-3" disk #19 (SCSI ID #0) (SCSI LUN #1)
/dev/rdisk/dsk167f:     character special (19/2738) SCSI #3 "OPEN-3" disk #19 (SCSI ID #0) (SCSI LUN #1)
/dev/rdisk/dsk167g:     character special (19/2740) SCSI #3 "OPEN-3" disk #19 (SCSI ID #0) (SCSI LUN #1)
/dev/rdisk/dsk167h:     character special (19/2742) SCSI #3 "OPEN-3" disk #19 (SCSI ID #0) (SCSI LUN #1)
/dev/rdisk/dsk168a:     character special (19/2744) SCSI #3 "OPEN-3" disk #20 (SCSI ID #0) (SCSI LUN #2)
/dev/rdisk/dsk168b:     character special (19/2746) SCSI #3 "OPEN-3" disk #20 (SCSI ID #0) (SCSI LUN #2)
/dev/rdisk/dsk168c:     character special (19/2748) SCSI #3 "OPEN-3" disk #20 (SCSI ID #0) (SCSI LUN #2)
/dev/rdisk/dsk168d:     character special (19/2750) SCSI #3 "OPEN-3" disk #20 (SCSI ID #0) (SCSI LUN #2)
/dev/rdisk/dsk168e:     character special (19/2752) SCSI #3 "OPEN-3" disk #20 (SCSI ID #0) (SCSI LUN #2)
/dev/rdisk/dsk168f:     character special (19/2754) SCSI #3 "OPEN-3" disk #20 (SCSI ID #0) (SCSI LUN #2)
/dev/rdisk/dsk168g:     character special (19/2756) SCSI #3 "OPEN-3" disk #20 (SCSI ID #0) (SCSI LUN #2)
/dev/rdisk/dsk168h:     character special (19/2758) SCSI #3 "OPEN-3" disk #20 (SCSI ID #0) (SCSI LUN #2)
/dev/rdisk/dsk169a:     character special (19/2760) SCSI #3 "OPEN-3" disk #21 (SCSI ID #0) (SCSI LUN #3)
/dev/rdisk/dsk169b:     character special (19/2762) SCSI #3 "OPEN-3" disk #21 (SCSI ID #0) (SCSI LUN #3)
/dev/rdisk/dsk169c:     character special (19/2764) SCSI #3 "OPEN-3" disk #21 (SCSI ID #0) (SCSI LUN #3)
/dev/rdisk/dsk169d:     character special (19/2766) SCSI #3 "OPEN-3" disk #21 (SCSI ID #0) (SCSI LUN #3)
/dev/rdisk/dsk169e:     character special (19/2768) SCSI #3 "OPEN-3" disk #21 (SCSI ID #0) (SCSI LUN #3)
/dev/rdisk/dsk169f:     character special (19/2770) SCSI #3 "OPEN-3" disk #21 (SCSI ID #0) (SCSI LUN #3)
/dev/rdisk/dsk169g:     character special (19/2772) SCSI #3 "OPEN-3" disk #21 (SCSI ID #0) (SCSI LUN #3)
/dev/rdisk/dsk169h:     character special (19/2774) SCSI #3 "OPEN-3" disk #21 (SCSI ID #0) (SCSI LUN #3)
/dev/rdisk/dsk170a:     character special (19/2776) SCSI #3 "OPEN-3" disk #22 (SCSI ID #0) (SCSI LUN #4)
/dev/rdisk/dsk170b:     character special (19/2778) SCSI #3 "OPEN-3" disk #22 (SCSI ID #0) (SCSI LUN #4)
/dev/rdisk/dsk170c:     character special (19/2780) SCSI #3 "OPEN-3" disk #22 (SCSI ID #0) (SCSI LUN #4)
/dev/rdisk/dsk170d:     character special (19/2782) SCSI #3 "OPEN-3" disk #22 (SCSI ID #0) (SCSI LUN #4)
/dev/rdisk/dsk170e:     character special (19/2784) SCSI #3 "OPEN-3" disk #22 (SCSI ID #0) (SCSI LUN #4)
/dev/rdisk/dsk170f:     character special (19/2786) SCSI #3 "OPEN-3" disk #22 (SCSI ID #0) (SCSI LUN #4)
/dev/rdisk/dsk170g:     character special (19/2788) SCSI #3 "OPEN-3" disk #22 (SCSI ID #0) (SCSI LUN #4)
/dev/rdisk/dsk170h:     character special (19/2790) SCSI #3 "OPEN-3" disk #22 (SCSI ID #0) (SCSI LUN #4)
/dev/rdisk/dsk171a:     character special (19/2792) SCSI #3 "OPEN-3" disk #23 (SCSI ID #0) (SCSI LUN #5)
/dev/rdisk/dsk171b:     character special (19/2794) SCSI #3 "OPEN-3" disk #23 (SCSI ID #0) (SCSI LUN #5)
/dev/rdisk/dsk171c:     character special (19/2796) SCSI #3 "OPEN-3" disk #23 (SCSI ID #0) (SCSI LUN #5)
/dev/rdisk/dsk171d:     character special (19/2798) SCSI #3 "OPEN-3" disk #23 (SCSI ID #0) (SCSI LUN #5)
/dev/rdisk/dsk171e:     character special (19/2800) SCSI #3 "OPEN-3" disk #23 (SCSI ID #0) (SCSI LUN #5)
/dev/rdisk/dsk171f:     character special (19/2802) SCSI #3 "OPEN-3" disk #23 (SCSI ID #0) (SCSI LUN #5)
/dev/rdisk/dsk171g:     character special (19/2804) SCSI #3 "OPEN-3" disk #23 (SCSI ID #0) (SCSI LUN #5)
/dev/rdisk/dsk171h:     character special (19/2806) SCSI #3 "OPEN-3" disk #23 (SCSI ID #0) (SCSI LUN #5)
/dev/rdisk/dsk172a:     character special (19/2808) SCSI #3 "OPEN-3" disk #24 (SCSI ID #0) (SCSI LUN #6)
/dev/rdisk/dsk172b:     character special (19/2810) SCSI #3 "OPEN-3" disk #24 (SCSI ID #0) (SCSI LUN #6)
/dev/rdisk/dsk172c:     character special (19/2812) SCSI #3 "OPEN-3" disk #24 (SCSI ID #0) (SCSI LUN #6)
/dev/rdisk/dsk172d:     character special (19/2814) SCSI #3 "OPEN-3" disk #24 (SCSI ID #0) (SCSI LUN #6)
/dev/rdisk/dsk172e:     character special (19/2816) SCSI #3 "OPEN-3" disk #24 (SCSI ID #0) (SCSI LUN #6)
/dev/rdisk/dsk172f:     character special (19/2818) SCSI #3 "OPEN-3" disk #24 (SCSI ID #0) (SCSI LUN #6)
/dev/rdisk/dsk172g:     character special (19/2820) SCSI #3 "OPEN-3" disk #24 (SCSI ID #0) (SCSI LUN #6)
/dev/rdisk/dsk172h:     character special (19/2822) SCSI #3 "OPEN-3" disk #24 (SCSI ID #0) (SCSI LUN #6)
/dev/rdisk/dsk173a:     character special (19/2824) SCSI #3 "OPEN-3" disk #25 (SCSI ID #0) (SCSI LUN #7)
/dev/rdisk/dsk173b:     character special (19/2826) SCSI #3 "OPEN-3" disk #25 (SCSI ID #0) (SCSI LUN #7)
/dev/rdisk/dsk173c:     character special (19/2828) SCSI #3 "OPEN-3" disk #25 (SCSI ID #0) (SCSI LUN #7)
/dev/rdisk/dsk173d:     character special (19/2830) SCSI #3 "OPEN-3" disk #25 (SCSI ID #0) (SCSI LUN #7)
/dev/rdisk/dsk173e:     character special (19/2832) SCSI #3 "OPEN-3" disk #25 (SCSI ID #0) (SCSI LUN #7)
/dev/rdisk/dsk173f:     character special (19/2834) SCSI #3 "OPEN-3" disk #25 (SCSI ID #0) (SCSI LUN #7)
/dev/rdisk/dsk173g:     character special (19/2836) SCSI #3 "OPEN-3" disk #25 (SCSI ID #0) (SCSI LUN #7)
/dev/rdisk/dsk173h:     character special (19/2838) SCSI #3 "OPEN-3" disk #25 (SCSI ID #0) (SCSI LUN #7)
```

Figure 3-1 Verifying the Character-Type Device Files

```
# file /dev/disk/dsk173*
/dev/disk/dsk173a:      block special (19/2823)
/dev/disk/dsk173b:      block special (19/2825)
/dev/disk/dsk173c:      block special (19/2827)
/dev/disk/dsk173d:      block special (19/2829)
/dev/disk/dsk173e:      block special (19/2831)
/dev/disk/dsk173f:      block special (19/2833)
/dev/disk/dsk173g:      block special (19/2835)
/dev/disk/dsk173h:      block special (19/2837)
```

Figure 3-2 Verifying the Block-Type Device Files Using the File Command

```
# hwmgr -view devices
 HWID: Device Name          Mfg      Model            Location
 ------------------------------------------------------------------------------
    3: scp                           (unknown)        (unknown)
    4: /dev/kevm
   54: /dev/disk/floppy0c            3.5in floppy     fdi0-unit-0
   58: /dev/disk/cdrom0c    DEC      RRD46   (C) DEC  bus-0-targ-5-lun-0
   59: /dev/disk/dsk0c      DEC      RZ1CB-CA (C) DEC bus-2-targ-1-lun-0
   60: /dev/disk/dsk1c      DEC      RZ1CB-CA (C) DEC bus-2-targ-3-lun-0
   61: /dev/disk/dsk2c      DEC      RZ1CB-CA (C) DEC bus-2-targ-5-lun-0
   62: /dev/ntape/tape0     DEC      TLZ09     (C)DEC bus-0-targ-6-lun-0
  129: /dev/dmapi/dmapi
  230: /dev/disk/dsk166c    HITACHI  OPEN-3           bus-1-targ-0-lun-0
  231: /dev/disk/dsk167c    HITACHI  OPEN-3           bus-1-targ-0-lun-1
  232: /dev/disk/dsk168c    HITACHI  OPEN-3           bus-1-targ-0-lun-2
  233: /dev/disk/dsk169c    HITACHI  OPEN-3           bus-1-targ-0-lun-3
  234: /dev/disk/dsk170c    HITACHI  OPEN-3           bus-1-targ-0-lun-4
  235: /dev/disk/dsk171c    HITACHI  OPEN-3           bus-1-targ-0-lun-5
  236: /dev/disk/dsk172c    HITACHI  OPEN-3           bus-1-targ-0-lun-6
  237: /dev/disk/dsk173c    HITACHI  OPEN-3           bus-1-targ-0-lun-7
```

Figure 3-3 Verifying the Block-Type Device Files Using the File Command

Enabling Command Tag Queuing

You need to add the USP V device information to the device definition file (**/etc/ddr.dbase**) to enable SCSI command tag queuing for all new USP V devices. Table 3-1 lists the queue depth requirements for USP V devices.

Table 3-1 Queue Depth Requirements for the USP V Devices

Parameter	Required Value
Queue depth per LU (TagQueueDepth)	= 32 per LU
Queue depth per port	≤ 1024 per port

To enable SCSI command tag queuing for USP V devices:

1. Before editing, make a backup copy of the **/etc/ddr.dbase** file.
2. Edit the **ddr.dbase** file (e.g., using **vi** editor) to add the USP V device information (see Figure 3-4). For ddr_dbase parameters, see Table 3-2.
3. Update and validate the contents of the edited **ddr.dbase** file:
   ddr_config –c
   It is not necessary to reboot.
4. Verify the new USP V device information: **ddr_config -s disk "HITACHI" "OPEN-X"** where **X** is the device type (e.g., **OPEN-E**) (see Figure 3-5). The device information you just entered should be displayed.

```
# cp /etc/ddr.dbase /etc/ddr.dbase.standard                    ← Back up the file.
# vi /etc/ddr.dbase
  :
SCSIDEVICE
  #
  #
  Type = disk
  Name = "HITACHI" "OPEN-3"
  #              .
  PARAMETERS:                                                  ← Add this information.
   TypeSubClass           = hard_disk, raid
   BadBlockRecovery       = disabled
   TagQueueDepth          = 32      ← See Table 3-1.
   DisperseQueue          = false
   RequestSenseLength     = 96
ATTRIBUTE:
   AttributeName   = "VPDinfo"
   Length          = 16
   Ubyte [0]       = 0x00
   Ubyte [1]       = 0x00
   Ubyte [2]       = 0x00
   Ubyte [3]       = 0x00                                      ← Add this information
   Ubyte [4]       = 0x00                                        for Tru64 UNIX 5.1.
   Ubyte [5]       = 0x0f
   Ubyte [6]       = 0x00
   Ubyte [7]       = 0x00
   Ubyte [8]       = 0x00
   Ubyte [9]       = 0x00
   Ubyte [10]      = 0x00
   Ubyte [11]      = 0x00
   Ubyte [12]      = 0x00
   Ubyte [13]      = 0x00
   Ubyte [14]      = 0x00
   Ubyte [15]      = 0x00

 : wq!                                                         ← Press ESC, save and exit.
```

Figure 3-4 Adding the Device Information to the ddr.dbase File

Table 3-2 Parameters for ddr_dbase

Disk Type	Type	Name	TypeSubClass	BadBlock - Recovery	TagQueue -Depth	Disperse - Queue	Request Sense-Length
OPEN-3	disk	"HITACHI" "OPEN-3"	hard_disk, raid	disabled	Per Table 3-1	false	96
OPEN-8	disk	"HITACHI" "OPEN-8"	hard_disk, raid	disabled		false	96
OPEN-9	disk	"HITACHI" "OPEN-9"	hard_disk, raid	disabled		false	96
OPEN-E	disk	"HITACHI" "OPEN-E"	hard_disk, raid	disabled		false	96
OPEN-L	disk	"HITACHI" "OPEN-L"	hard_disk, raid	disabled		false	96
OPEN-3 VLL	disk	"HITACHI" "OPEN-3-CVS"	hard_disk, raid	disabled		false	96
OPEN-8 VLL	disk	"HITACHI" "OPEN-8-CVS"	hard_disk, raid	disabled		false	96
OPEN-9 VLL	disk	"HITACHI" "OPEN-9-CVS"	hard_disk, raid	disabled		false	96
OPEN-E VLL	disk	"HITACHI" "OPEN-E-CVS"	hard_disk, raid	disabled		false	96
OPEN-V	disk	"HITACHI" "OPEN-V"	hard_disk, raid	disabled		false	128
OPEN-8*n (n=2 to 36)	disk	"HITACHI" "OPEN-8*n"	hard_disk, raid	disabled		false	96
OPEN-9*n (n=2 to 36)	disk	"HITACHI" "OPEN-9*n"	hard_disk, raid	disabled		false	96
OPEN-E*n (n=2 to 36)	disk	"HITACHI" "OPEN-E*n"	hard_disk, raid	disabled		false	96
OPEN-L*n	disk	"HITACHI" "OPEN-L*n"	hard_disk, raid	disabled		false	96
OPEN-3*n-VLL (n=2 to 36)	disk	"HITACHI" "OPEN-3*n-CVS"	hard_disk, raid	disabled		false	96
OPEN-8*n-VLL (n=2 to 36)	disk	"HITACHI" "OPEN-8*n-CVS"	hard_disk, raid	disabled		false	96
OPEN-9*n-VLL (n=2 to 36)	disk	"HITACHI" "OPEN-9*n-CVS"	hard_disk, raid	disabled		false	96
OPEN-E*n-VLL (n=2 to 36)	disk	"HITACHI" "OPEN-E*n-CVS"	hard_disk, raid	disabled		false	96
OPEN-V*n	disk	"HITACHI" "OPEN-V*n"	hard_disk, raid	disabled		false	128

```
# ddr_config -s disk "HITACHI" "OPEN-3"                    ← Specify the device
type.
Building Device Information for:
  Type = disk
  Vendor ID: "HITACHI"   Product ID: "OPEN-3"
Applying Modifications from Device Record for :
  Stype: 0x0   Vendor ID: "HITACHI"   Product ID: "OPEN-3"
    TypeSubClass = hard_disk, RAID
    BadBlockRecovery = disabled
    DisperseQueue = false
    TagQueueDepth = 0x20
    RequestSenseLength = 0x60
    AttributeCnt = 0x1
    Attribute[0].Name = VPDinfo
    Attribute[0].Length = 0x10
    Attribute[0].Data.ulong = 0x00000f0000000000
The resulting SCSI Device information looks as follows:
SCSIDEVICE
    Type = disk
    Name = "HITACHI" "OPEN-3"
    PARAMETERS:
       TypeSubClass               = hard_disk, RAID
       BlockSize                  = 0x200
       MaxTransferSize            = 0x1000000
       BadBlockRecovery           = disabled
       SyncTransfers              = enabled
       DynamicGeometry            = false
       Disconnects                = enabled
       TaggedQueuing              = enabled
       CmdReordering              = enabled
       LongTimeoutRetry           = disabled
       DisperseQueue              = false
       WideTransfers              = enabled
       WCE_Capable                = true
       PwrMgmt_Capable            = true
       Additional_Flags           = 0x0
       TagQueueDepth              = 0x20
       ReadyTimeSeconds           = 0x2d
       CMD_PreventAllow           = notsupported
       CMD_ExtReserveRelease      = notsupported
       CMD_WriteVerify            = notsupported
       Additional_Cmds            = 0x0
       InquiryLength              = 0x24
       RequestSenseLength         = 0x60
    ATTRIBUTE:
       AttributeName = VPDinfo
       Length        = 16
       Ubyte[   0]   = 0x00
       Ubyte[   1]   = 0x00
       Ubyte[   2]   = 0x00
       Ubyte[   3]   = 0x00
       Ubyte[   4]   = 0x00
       Ubyte[   5]   = 0x0f
       Ubyte[   6]   = 0x00
       Ubyte[   7]   = 0x00
       Ubyte[   8]   = 0x00
       Ubyte[   9]   = 0x00
       Ubyte[  10]   = 0x00
       Ubyte[  11]   = 0x00
       Ubyte[  12]   = 0x00
       Ubyte[  13]   = 0x00
       Ubyte[  14]   = 0x00
       Ubyte[  15]   = 0x00
#
```

Figure 3-5 Verifying the Device Information in the ddr.dbase

Setting the I/O Timeout Value

For Tru64 UNIX systems, the non-I/O timeout value is 10 seconds. You need to edit the **/sys/data/cam_data.c** file to change this value to 60 seconds. To set the I/O timeout value:

1. Edit the **/sys/data/cam_data.c** file (e.g. vi editor) to change u_long cdisk-to-def to **60** (see Figure 3-6).
2. After editing the **/sys/data/cam_data.c** file, reconfigure the kernel (see Figure 3-7).
3. For final verification, reboot the system (now or later) and be sure that the system operates normally with the newly reconfigured kernel. If the system does not reboot correctly, reboot using the backup copy of the kernel (**boot -fi vmunix.backup**) and check the edited files and entered values.

Note: Use caution when doing online volume installation. If you cannot reboot the system, check the reconfigured kernel later or use normal disruptive installation procedure.

```
# cp /sys/data/cam_data.c /sys/data/cam_data.c.backup                    ← Back up the file.
# vi /sys/data/cam_data.c
   :
   :
/*
 * Changeable disk driver timeouts. Cdisk_to_def for non read/write
 * commands to the disks (test unit ready, mode select etc.)
 * cdisk_io_def Hard fixed disk timeout value for i/o, and
 * cdisk_io_rmb for removable media disks since they are slow.
 */
u_long cdisk_to_def = 60; /* 60 seconds */              ← Change 10 [sec] to 60 [sec].
u_long cdisk_io_def = 60; /* 60 seconds (Tagged commands) */
u_long cdisk_io_rmb = 120;/* 120 seconds (slow removables) */
   :
   :
 : wq                                                   ← Enter : wq! to save and
exit.
#
```

Figure 3-6 Changing the I/O Timeout Value

```
# cp /vmunix /vmunix.backup                                  ← Make a backup copy first.
# doconfig -c DEC8400                        ← Specify the config_file (usually system name).
*** KERNEL CONFIGURATION AND BUILD PROCEDURE ***

Saving /sys/conf/DEC8400 as /sys/conf/DEC8400.bak

Do you want to edit the configuration file? (y/n) [n]: y          ← If 'n', go to ←.

Using /usr/dt/bin/dtpad to edit the configuration file.  Press return when ready,
or type 'quit' to skip the editing session:                   ← If 'quit', go to ←.
Warning: locale not supported by C library, locale unchanged


*** PERFORMING KERNEL BUILD ***           ←                      ← Start here if you
Working....Thu Feb 19 14:20:06 JST 1998                    entered 'n' or 'quit' above.

The new kernel is /sys/DEC8400/vmunix
# mv /sys/DEC8400/vmunix /
#
```

Figure 3-7 Reconfiguring the Kernel

Registering the Disk Types

Register the disk types of the USP V system. Figure 3-8 shows an example for an OPEN-3 device and an OPEN-9-VLL with 1000 cylinders. See Appendix A for the parameters for the USP V disk types. If the partition size or offset is different for each LU, you should register a different disk type name for each. Partition c must be allocated to all areas of the LU.

```
# cp /etc/disktab /etc/disktab.backup                          ← Make a backup.
# vi /etc/disktab                                              ← Edit the file.
 :
OPEN-3|HITACHI DKC460:
  ↖ Customize disk name if necessary.
   :ty=winchester:dt=SCSI:ns#96:nt#15:nc#3338:rm#6300: \       ← See Appendix A for
   :oa#0:pa#131072:ba#8192:fa#1024: \                             disk parameters.
   :ob#131072:pb#262144:bb#8192:fb#1024: \
   :oc#0:pc#4806720:bc#8192:fc#1024: \
   :od#0:pd#0:bd#8192:fd#1024: \
   :oe#0:pe#0:be#8192:fe#1024: \
   :of#0:pf#0:bf#8192:ff#1024: \
   :og#393216:pg#2206752:bg#8192:fg#1024: \
   :oh#2599968:ph#2206752:bh#8192:fh#1024:
OPEN-9-CVS-1000|HITACHI DKC460: \
   :ty=winchester:dt=SCSI:ns#96:nt#15:nc#1000:rm#6300: \
   :oa#0:pa#131072:ba#8192:fa#1024: \
   :ob#131072:pb#262144:bb#8192:fb#1024: \
   :oc#0:pc#1444000:bc#8192:fc#1024: \
   :od#0:pd#0:bd#8192:fd#1024: \
   :oe#0:pe#0:be#8192:fe#1024: \
   :of#0:pf#0:bf#8192:ff#1024: \
   :og#393216:pg#523392:bg#8192:fg#1024: \
   :oh#916608:ph#523392:bh#8192:fh#1024:
 :
 : wq!                                                          ← Press ESC, save and exit.
```

Figure 3-8 Registering the Disk Types

Writing the Partition Labels

Use the **disklabel** command to label the partition for each new device (see Figure 3-9). Check that no errors are found in the partition settings after the labeling. The example in Figure 3-9 shows dsk10 being labeled with the predefined OPEN-3 partition table from Appendix A. If the command **disklabel −rw dsk10** had been executed instead, a default partition table would be placed on dsk10.

Note: You can also create a customized partition layout by using the disklabel -e command.

When the **disklabel -e** command is executed, the system's editor opens. When done editing, save the file and answer **yes** when the system prompts you to write the label out to the disk. The **disklabel −e** command does not work if the disk is unlabeled. Use the **disklabel −rw** command first to write out a default label.

```
# disklabel -rw  dsk10 OPEN-3
# disklabel -r  dsk10
```

Figure 3-9 Writing the Partition Labels Using a Predefined Disk Type

Creating the File Systems

After writing the partition labels, you can create a file system for each new USP V SCSI disk device. If desired, you can use the Advanced File System (AdvFS) to overcome the size and speed limitations of the UNIX file system. The type of file system is application-dependent. If you are not sure which file system is right for your setup, please contact HP customer support.

WARNING: Do not create file systems for disk devices which will be accessed as raw devices.

UNIX File System (UFS)

To create a UNIX file system, use the **newfs** command with the character-type device file name. For example, to create the file system for device **dsk10c**, enter: **`newfs /dev/rdisk/dsk10c OPEN-3`**

Advanced File System (AdvFS)

To create an advanced file system:

1. You can either create a new AdvFS domain or add a new fileset to an existing domain.
   a. To create a new domain: **`mkfdmn <device_file_name> <domain_name>`**

      Use the block-type device file name. For example, to create an AdvFS domain called "dmn1" for device "dsk10c", enter: **`mkfdmn /dev/disk/dsk10c dmn1`**

   b. To add a new fileset to an existing domain:

      `mkfset <domain_name> <fileset_name>`

      For example, to create "fileset1" in "domain1", enter:

      `mkfset domain1 fileset1`
2. Repeat step 1 for each advanced file system you need to create.

Note: To allocate multiple disk partitions to a domain, the AdvFS Utilities must be installed.

After installing the utilities, use the **addvol** command to allocate multiple disk partitions to the domain, as shown in Figure 3-10. You can also perform this work after completing mount operations, as described later in this chapter.

```
# addvol /dev/disk/dsk10c dmn1
                ↖ Block-type device file and domain name.
#
```

Figure 3-10 Allocating Multiple Disk Partitions

Creating and Verifying the Mount Directories

After the file systems have been created, you can create and verify mount directories for the new USP V SCSI disk devices. Be sure to choose a unique name for each mount directory (e.g., a name which identifies the device being mounted).

Note: Do not create mount directories for disk devices that will be accessed as raw devices.

To create and verify the mount directories for the new devices (see Figure 3-11):

1. Use the **mkdir** command to create a new mount directory.
2. Use the **ls** command to verify the new mount directory.
3. Repeat steps 1 and 2 for each desired new mount directory.

```
# mkdir /USP_LU2                                          ← Create new mount directory.
#ls -x                                                   ← Verify new mount directory.
.mrg              ..DXsession     USP_LU2c               ← New mount directory appears.
CDROM             DXclock         DXprint
DXsessionMail     a               bin
cdfsdev           df300           df300-2
df300-3df300-4    df300-5         etc
homel             lib             lnn
mdecmnt           opt             osf_boot
picassoproc       real.profile    sbin
subsyssys         tcb             tmp
usrvar            vmunix          vmunix.stdrd
```

Figure 3-11 Creating and Verifying the Mount Directories

Mounting and Verifying the File Systems

After the file systems and mount directories have been created, you can mount each new USP V SCSI disk device and verify the file system.

To mount a device with a UNIX file system (UFS):

1. Mount the device by entering: **`mount <device_file_name> <mount_directory>`**

   For example, to mount device **dsk10c** with mount directory name **USP_LU2c**, enter:

   `mount /dev/disk/dsk10c /USP_LU2c`

2. Assign the appropriate ownership and permissions by entering:

   `chown <owner>:<group> *<device_file_name>*`

   For example, to assign ownership to **dsk10c** with owner **Oracle**, group **dba**, enter:

   `chown oracle:dba *dsk10c*`

3. Repeat steps 1 and 2 for each new USP V device with a UNIX file system.

To mount a device with an advanced file system (AdvFS):

1. Mount the device by entering:

   `mount -t advfs <domain_name>#<fileset_name> <mount_directory>`

   For example, to mount the device with mount directory **USP_LU2c** enter:

   `mount -t advfs domain1#fileset1 /USP_LU2c`

2. Assign the appropriate ownership and permissions by entering:

   `chown <owner>:<group> *<device_file_name>*`

   For example, to assign ownership to **dsk10c** with owner **Oracle**, group **dba**, enter:

   `chown oracle:dba *dsk10c*`

3. Repeat steps 1 and 2 for each new USP V device with an advanced file system.

Verifying the File Systems. After mounting all new USP V devices, you need to verify that the new file systems were created correctly and are functioning properly. To verify the new file systems:

1. Display all mounted file systems (**df** command) and verify that the new file systems were created correctly (see Figure 3-12).

Note: To view capacity in kilobytes instead of 512-byte blocks, use the **df -k** command.

2. Verify the operation of each new file system as follows (see Figure 3-13):
   a. Go to the new device directory: **cd /<mount_directory>**
   b. Copy a file from the root directory to the new device:
      cp /<file_name> <file_name>.back1
      For example, to copy file **vmunix** from the root directory to the USP_LU2c device, enter: **cp /vmunix vmunix.back1**
   c. Copy a file to the new device again. For example, to copy the same file again, enter: **cp /vmunix vmunix.back2**
   d. List the files in the current directory by entering: **ls -l**
   e. Remove the files you copied by entering: **rm <file_name>**
3. Repeat step 2 for each new file system.

```
# df -k
Filesystem      1024-blocks    Used  Available  Capacity  Mounted on
root_domain#root      65536   53652       4824       92%    /
/proc                     0       0          0      100%    /proc
usr_domain#usr      1968128  437777    1512776       23%    /usr
/dev/disk/dsk10c    2328100       1    2095289        0%    /mnt2    ← File system for dsk10c
dmn11#set1          2403360      16    2398816        1%    /mnt1
```

Figure 3-12 Verifying the File Systems

```
# cd /mnt                                                    ← Go to mount directory.
# cp /vmunix vmunix.back1                                    ← Copy a file.
# ls -l                                                      ← List files.
total 7240
-rwxr-xr-x   1   root  system  7397832 Nov 14 15:08  vmunix.back1
# cp /vmunix vmunix.back2                                    ← Copy a file again.
# ls -l                                                      ← List files.
total 14480
-rwxr-xr-x   1   root  system  7397832 Nov 14 15:08  vmunix.back1
-rwxr-xr-x   1   root  system  7397832 Nov 14 15:12  vmunix.back2
# rm vmunix.back1 vmunix.back2                               ← Remove test files.
#
```

Figure 3-13 Verifying File System Operation

Setting and Verifying the Auto-Mount Parameters

The final step in configuring the new USP V devices is to set up and verify the auto-mount parameters for each new SCSI disk device. The **/etc/fstab** file contains the auto-mount parameters for the disk devices.

To set and verify the auto-mount parameters (see Figure 3-14):

1. Make a backup copy of the **/etc/fstab** file before editing.
2. Edit the **/etc/fstab** file to add a line for each new device to be auto-mounted. Table 3-3 shows the auto-mount parameters required for each device. When you are finished editing the **/etc/fstab** file, save your changes and exit.

Note: If you make a mistake while editing, exit the editor without saving your changes and then begin editing again.

3. The next time you reboot the Tru64 UNIX system, verify that the new devices were auto-mounted using the **df** (or **df -k**) command. If the system does not reboot properly, check the auto-mount settings later or use the **mount -a** command to check the **/etc/fstab** file.

```
# cp -ip /etc/fstab /etc/fstab.standard                    ← Back up the file first.
# vi /etc/fstab                                            ← Edit the file.
①                  ②          ③       ④     ⑤    ⑥       ← Refer to Table 3-3.
root_domain #root  /          advfs    rw    0    0
/proc              /proc      profs    rw    0    0
usr_domain#usr     /usr       ufs      sw    0    0
/dev/rz0b           swap      ufs      sw    0    2
/dev/disk/dsk10c   /mnt2      ufs      rw    1    2        ← UFS
dmn1#set1          /mnt1      advfs    rw    0    0        ← AdvFS


: wq!                                                      ← When done, press ESC, save and exit.
```

Figure 3-14 Setting and Verifying the Auto-Mounting Parameters

Table 3-3 Auto-Mount Parameters

Parameter #	Name	Enter
①	Device to mount	Block type device filename
②	Mount point	Mount directory name
③	File system	Type of file system (e.g., UFS, AdvFS)
④	Mount options	Options (i.e., rw for read-write)
⑤	Frequency dump in days	# of days (e.g., 1, 2, 3)
⑥	File system check (fsck)	Order of performing file system checks

4

Failover and SNMP Operation

The USP V system supports industry-standard products and functions which provide host and/or application failover, I/O path failover, and logical volume management (LVM). For the Tru64 UNIX environment, the USP V systems support the following products and functions (contact Hitachi Data Systems for the latest information):

- ☐ TruCluster for Host Failover
- ☐ Tru64 Path Failover
- ☐ SNMP Remote System Management

The USP V system also supports the industry-standard simple network management protocol (SNMP) for remote subsystem management from the UNIX/PC server host. SNMP is used to transport management information between the USP V service processor (SVP) and the SNMP manager on the host. The SNMP agent on the USP V SVP sends status information to the host(s) when requested by the host or when a significant event occurs.

Note: The user is responsible for configuring the failover and SNMP management software on the UNIX/PC server host. For assistance with failover and/or SNMP configuration on the host, refer to the user documentation or contact the vendor's technical support.

TruCluster for Host Failover

The USP V system supports the TruCluster product for the Tru64 UNIX operating system. Please contact HP for the latest information on the TruCluster product.

Install the USP V as described in Installing the USP V and configure boot devices as described in Setting Up Boot Devices. Then install and configure the TruCluster software on the host server(s) using the USP V devices as the cluster disks. For assistance with specific configuration issues related to the USP V system, please contact the Hitachi Data Systems Support Center (see Calling the Hitachi Data Systems Support Center).

Tru64 Path Failover

The USP V supports Tru64 path failover. Multiple HBAs are connected to the USP V system with commonly shared LUNs. On Tru64 UNIX systems, path failover is configured automatically.

To verify that all of the paths are available, perform the following procedure:

1. Type **`hwmgr -view devices`** to obtain the HWID (see Figure 4-1).
2. Type **`hwmgr -show scsi –full –id HWID`** to confirm the status (see Figure 4-1).

Note: If both paths are connected, the status is **Valid**. If only one path is connected, the status is **Valid/Stale**.

To test the path failover function, disconnect and reconnect the cables connecting the host to the USP V, and use steps 1 and 2 to verify that the path status is correct.

```
# hwmgr -view devices
 HWID: Device Name        Mfg     Model          Location
 ------------------------------------------------------------
   3: scp                 (unknown)       (unknown)
   4: /dev/kevm
  54: /dev/disk/floppy0c          3.5in floppy    fdi0-unit-0
  58: /dev/disk/cdrom0c   DEC     RRD46  (C) DEC  bus-0-targ-5-lun-0
  59: /dev/disk/dsk0c     DEC     RZ1CB-CA (C) DEC bus-2-targ-1-lun-0
  60: /dev/disk/dsk1c     DEC     RZ1CB-CA (C) DEC bus-2-targ-3-lun-0
  61: /dev/disk/dsk2c     DEC     RZ1CB-CA (C) DEC bus-2-targ-5-lun-0
  62: /dev/ntape/tape0    DEC     TLZ09    (C)DEC bus-0-targ-6-lun-0
 129: /dev/dmapi/dmapi
 230: /dev/disk/dsk166c   HITACHI  OPEN-3         bus-1-targ-0-lun-0
 231: /dev/disk/dsk167c   HITACHI  OPEN-3         bus-1-targ-0-lun-1
 232: /dev/disk/dsk168c   HITACHI  OPEN-3         bus-1-targ-0-lun-2
 233: /dev/disk/dsk169c   HITACHI  OPEN-3         bus-1-targ-0-lun-3
 234: /dev/disk/dsk170c   HITACHI  OPEN-3         bus-1-targ-0-lun-4
 235: /dev/disk/dsk171c   HITACHI  OPEN-3         bus-1-targ-0-lun-5
 236: /dev/disk/dsk172c   HITACHI  OPEN-3         bus-1-targ-0-lun-6
 237: /dev/disk/dsk173c   HITACHI  OPEN-3         bus-1-targ-0-lun-7

# hwmgr -show scsi -full -id 237

     SCSI            DEVICE   DEVICE  DRIVER NUM  DEVICE FIRST
 HWID:  DEVICEID HOSTNAME  TYPE     SUBTYPE OWNER  PATH FILE   VALID PATH
 ------------------------------------------------------------
 237:  177     alpha1    disk     none   0     2   dsk173 [3/0/7]

    WWID:01000010:6006-0e80-0427-2e00-0000-272e-0000-0227


    BUS   TARGET  LUN   PATH STATE
    ------------------
    3     0     7     valid
    1     0     7     valid
```

Figure 4-1 Using the hwmgr Command to Verify the Path Status

SNMP Remote System Management

SNMP is a part of the TCP/IP protocol suite that supports maintenance functions for storage and communication devices. The USP V uses SNMP to transfer status and management commands to the SNMP Manager on the open-system server host via a notebook PC (see Figure 4-2). When the SNMP manager requests status information or when a service information message (SIM) occurs, the SNMP agent on the USP V notifies the SNMP manager on the open-system server. Notification of USP V error conditions is made in real time, providing the open-system server user with the same level of monitoring and support available to the mainframe user. The SIM reporting via SNMP enables the user to monitor the USP V from the open-system server host.

When a SIM occurs, the USP V SNMP agent initiates trap operations, which alert the SNMP manager of the SIM condition. The SNMP manager receives the SIM traps from the SNMP agent, and can request information from the SNMP agent at any time.

Note: The user is responsible for configuring the SNMP manager on the open-system host. For assistance with SNMP manager configuration on the open-system host, refer to the user documentation, or contact the vendor's technical support.

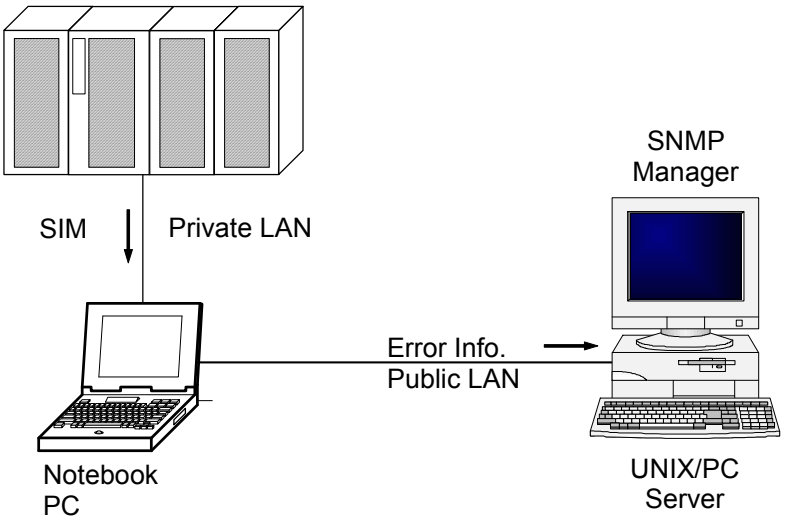

Figure 4-2 Example of a USP V SNMP Environment

5

Troubleshooting

This chapter provides information to help you identify and resolve problems in the unlikely event you encounter a problem with the USP V and includes instructions for calling technical support.

- ☐ Troubleshooting Error Conditions
- ☐ Calling the Hitachi Data Systems Support Center

Note: For additional troubleshooting information, refer to the *Hitachi Universal Storage Platform V User and Reference Guide* (MK-96RD635).

Troubleshooting Error Conditions

Table 5-1 lists potential error conditions that may occur during the USP V installation and provides instructions for resolving each condition. If you cannot resolve an error condition, please contact your Hitachi Data Systems representative for help, or call the Hitachi Data Systems Support Center for assistance.

Table 5-1 Troubleshooting

Error Condition	Recommended Action
The logical devices are not recognized by the system.	Be sure the READY indicator lights on the USP V system are ON. Be sure the fibre-channel cables are correctly installed and firmly connected.
File system cannot be created.	Be sure the character-type device file exists and is entered correctly.
The file system is not mounted after rebooting.	Be sure the system was restarted properly. Be sure the auto-mount information in the /**etc/fstab** file is correct.

Calling the Hitachi Data Systems Support Center

If you need to call the Hitachi Data Systems Support Center, provide as much information about the problem as possible. Include the circumstances surrounding the error or failure, the exact content of any messages displayed and the severity levels and reference codes of the R-SIMs on the R-SIM panel.

The Hitachi Data Systems customer support staff is available 24 hours/day, seven days a week. If you need technical support, please call:

- United States: (800) 446-0744
- Outside the United States: (858) 547-4526

Disk Parameters for USP V Disk Types

Table A-1 shows disk parameters for all the devices that can be supported. For information about configuring devices other than OPEN+V, please contact your Hitachi Data Systems representative.

Table A-1 Parameter Values for USP V Disk Types (1/5) (continues on the following page)

Parameter		Disk Type			
		OPEN-3	OPEN-9	OPEN-E	OPEN-L
Ty	Disk category	winchester	winchester	winchester	winchester
Dt	Control type	SCSI	SCSI	SCSI	SCSI
Ns	sectors/tracks	96	96	96	96
nt	tracks/cylinder	15	15	15	15
nc	Number of all cylinders	3338	10016	19759	19759
rm	Number of rotations of the disk	6300	6300	6300	6300
oa	a partition offset (Starting block in a partition)	Set optionally	Set optionally	Set optionally	Set optionally
ob	b partition offset (Starting block in b partition)	Set optionally	Set optionally	Set optionally	Set optionally
oc	c partition offset (Starting block in c partition)	0	0	0	0
od	d partition offset (Starting block in d partition)	Set optionally	Set optionally	Set optionally	Set optionally
oe	e partition offset (Starting block in e partition)	Set optionally	Set optionally	Set optionally	Set optionally
of	f partition offset (Starting block in f partition)	Set optionally	Set optionally	Set optionally	Set optionally
og	g partition offset (Starting block in g partition)	Set optionally	Set optionally	Set optionally	Set optionally
oh	h partition offset (Starting block in h partition)	Set optionally	Set optionally	Set optionally	Set optionally
pa	a partition size	Set optionally	Set optionally	Set optionally	Set optionally
pb	b partition size	Set optionally	Set optionally	Set optionally	Set optionally
pc	c partition size	4806720	14423040	28452960	28452960
pd	d partition size	Set optionally	Set optionally	Set optionally	Set optionally
pe	e partition size	Set optionally	Set optionally	Set optionally	Set optionally
pf	f partition size	Set optionally	Set optionally	Set optionally	Set optionally
pg	g partition size	Set optionally	Set optionally	Set optionally	Set optionally

Table A-1 Parameter Values for USP V Disk Types (1/5) (continued)

Parameter		Disk Type			
		OPEN-3	OPEN-9	OPEN-E	OPEN-L
ph	h partition size	Set optionally	Set optionally	Set optionally	Set optionally
ba	a partition block size	8192	8192	8192	8192
bb	b partition block size	8192	8192	8192	8192
bc	c partition block size	8192	8192	8192	8192
bd	d partition block size	8192	8192	8192	8192
be	e partition block size	8192	8192	8192	8192
bf	f partition block size	8192	8192	8192	8192
bg	g partition block size	8192	8192	8192	8192
bh	h partition block size	8192	8192	8192	8192
fa	a partition fragment size	1024	1024	1024	1024
fb	b partition fragment size	1024	1024	1024	1024
fc	c partition fragment size	1024	1024	1024	1024
fd	d partition fragment size	1024	1024	1024	1024
fe	e partition fragment size	1024	1024	1024	1024
ff	f partition fragment size	1024	1024	1024	1024
fg	g partition fragment size	1024	1024	1024	1024
fh	h partition fragment size	1024	1024	1024	1024

Table A-2 Parameter Values for USP V Disk Types (2/5) (continues on following page)

Parameter		Disk Type		
		OPEN-3 VLL	OPEN-9 VLL	OPEN-E VLL
ty	Disk category	winchester	winchester	winchester
dt	Control type	SCSI	SCSI	SCSI
ns	sectors/tracks	96	96	96
nt	tracks/cylinder	15	15	15
nc	Number of all cylinders	Depends on CV configuration	Depends on CV configuration	Depends on CV configuration
rm	Number of rotations of the disk	6300	6300	6300
oa	a partition offset (Starting block in a partition)	Set optionally	Set optionally	Set optionally
ob	b partition offset (Starting block in b partition)	Set optionally	Set optionally	Set optionally
oc	c partition offset (Starting block in c partition)	0	0	0
od	d partition offset (Starting block in d partition)	Set optionally	Set optionally	Set optionally
oe	e partition offset (Starting block in e partition)	Set optionally	Set optionally	Set optionally
of	f partition offset (Starting block in f partition)	Set optionally	Set optionally	Set optionally
og	g partition offset (Starting block in g partition)	Set optionally	Set optionally	Set optionally
oh	h partition offset (Starting block in h partition)	Set optionally	Set optionally	Set optionally
pa	a partition size	Set optionally	Set optionally	Set optionally
pb	b partition size	Set optionally	Set optionally	Set optionally
pc	c partition size	Depends on CV configuration	Depends on CV configuration	Depends on CV configuration
pd	d partition size	Set optionally	Set optionally	Set optionally
pe	e partition size	Set optionally	Set optionally	Set optionally
pf	f partition size	Set optionally	Set optionally	Set optionally
pg	g partition size	Set optionally	Set optionally	Set optionally
ph	h partition size	Set optionally	Set optionally	Set optionally
ba	a partition block size	8192	8192	8192
bb	b partition block size	8192	8192	8192
bc	c partition block size	8192	8192	8192

Table A-2 Parameter Values for USP V Disk Types (2/5) (continued)

Parameter		Disk Type		
		OPEN-3 VLL	OPEN-9 VLL	OPEN-E VLL
bd	d partition block size	8192	8192	8192
be	e partition block size	8192	8192	8192
bf	f partition block size	8192	8192	8192
bg	g partition block size	8192	8192	8192
bh	h partition block size	8192	8192	8192
fa	a partition fragment size	1024	1024	1024
fb	b partition fragment size	1024	1024	1024
fc	c partition fragment size	1024	1024	1024
fd	d partition fragment size	1024	1024	1024
fe	e partition fragment size	1024	1024	1024
ff	f partition fragment size	1024	1024	1024
fg	g partition fragment size	1024	1024	1024
fh	h partition fragment size	1024	1024	1024

Table A-3 Parameter Values for USP V Disk Types (3/5) (continues on following page)

Parameter		Disk Type			
		OPEN-3*n (n = 2 to 36)	OPEN-9*n (n = 2 to 36)	OPEN-E*n (n = 2 to 36)	OPEN-L*n (n = 2 to 12)
ty	Disk category	winchester	winchester	winchester	winchester
dt	Control type	SCSI	SCSI	SCSI	SCSI
ns	sectors/tracks	96	96	96	96
nt	tracks/cylinder	15	15	15	15
nc	Number of all cylinders	3338*n	Depends on CV configuration	19759*n	19759*n
rm	Number of rotations of the disk	6300	6300	6300	6300
oa	a partition offset (Starting block in a partition)	Set optionally	Set optionally	Set optionally	Set optionally
ob	b partition offset (Starting block in b partition)	Set optionally	Set optionally	Set optionally	Set optionally
oc	c partition offset (Starting block in c partition)	0	0	0	0
od	d partition offset (Starting block in d partition)	Set optionally	Set optionally	Set optionally	Set optionally
oe	e partition offset (Starting block in e partition)	Set optionally	Set optionally	Set optionally	Set optionally
of	f partition offset (Starting block in f partition)	Set optionally	Set optionally	Set optionally	Set optionally
og	g partition offset (Starting block in g partition)	Set optionally	Set optionally	Set optionally	Set optionally
oh	h partition offset (Starting block in h partition)	Set optionally	Set optionally	Set optionally	Set optionally
pa	a partition size	Set optionally	Set optionally	Set optionally	Set optionally
pb	b partition size	Set optionally	Set optionally	Set optionally	Set optionally
pc	c partition size	4806720*n	Depends on CV configuration	28452960*n	28452960*n
pd	d partition size	Set optionally	Set optionally	Set optionally	Set optionally
pe	e partition size	Set optionally	Set optionally	Set optionally	Set optionally
pf	f partition size	Set optionally	Set optionally	Set optionally	Set optionally
pg	g partition size	Set optionally	Set optionally	Set optionally	Set optionally
ph	h partition size	Set optionally	Set optionally	Set optionally	Set optionally
ba	a partition block size	8192	8192	8192	8192
bb	b partition block size	8192	8192	8192	8192
bc	c partition block size	8192	8192	8192	8192

Table A-3 Parameter Values for USP V Disk Types (3/5) (continued)

Parameter		Disk Type			
		OPEN-3*n (n = 2 to 36)	OPEN-9*n (n = 2 to 36)	OPEN-E*n (n = 2 to 36)	OPEN-L*n (n = 2 to 12)
bd	d partition block size	8192	8192	8192	8192
be	e partition block size	8192	8192	8192	8192
bf	f partition block size	8192	8192	8192	8192
bg	g partition block size	8192	8192	8192	8192
bh	h partition block size	8192	8192	8192	8192
fa	a partition fragment size	1024	1024	1024	1024
fb	b partition fragment size	1024	1024	1024	1024
fc	c partition fragment size	1024	1024	1024	1024
fd	d partition fragment size	1024	1024	1024	1024
fe	e partition fragment size	1024	1024	1024	1024
ff	f partition fragment size	1024	1024	1024	1024
fg	g partition fragment size	1024	1024	1024	1024
fh	h partition fragment size	1024	1024	1024	1024

Table A-4 Parameter Values for USP V Disk Types (4/5) (continues on following page)

Parameter		Disk Type		
		OPEN-3 VLL*n (n = 2 to 36)	OPEN-9 VLL*n (n = 2 to 36)	OPEN-E VLL*n (n = 2 to 36)
ty	winchester	winchester	winchester	winchester
dt	SCSI	SCSI	SCSI	SCSI
ns	96	96	96	116
nt	15	15	15	15
nc	Depends on CV configuration [3)]	19759	10016*n	Depends on CV configuration
rm	6300	6300	6300	6300
oa	Set optionally	Set optionally	Set optionally	Set optionally
ob	Set optionally	Set optionally	Set optionally	Set optionally
oc	0	0	0	0
od	Set optionally	Set optionally	Set optionally	Set optionally
oe	Set optionally	Set optionally	Set optionally	Set optionally
of	Set optionally	Set optionally	Set optionally	Set optionally
og	Set optionally	Set optionally	Set optionally	Set optionally
oh	Set optionally	Set optionally	Set optionally	Set optionally
pa	Set optionally [2)]	Set optionally	Set optionally	Set optionally
pb	Set optionally	Set optionally	Set optionally	Set optionally
pc	Depends on CV configuration [3)]	28452960	14423040*n	Depends on CV configuration
pd	Set optionally	Set optionally	Set optionally	Set optionally
pe	Set optionally	Set optionally	Set optionally	Set optionally
pf	Set optionally	Set optionally	Set optionally	Set optionally
pg	Set optionally	Set optionally	Set optionally	Set optionally
ph	Set optionally	Set optionally	Set optionally	Set optionally
ba	8192	8192	8192	8192
bb	8192	8192	8192	8192
bc	8192	8192	8192	8192
bd	8192	8192	8192	8192
be	8192	8192	8192	8192
bf	8192	8192	8192	8192
bg	8192	8192	8192	8192

Table A-4 Parameter Values for USP V Disk Types (4/5) (continued)

Parameter		Disk Type		
		OPEN-3 VLL*n (n = 2 to 36)	OPEN-9 VLL*n (n = 2 to 36)	OPEN-E VLL*n (n = 2 to 36)
bh	8192	8192	8192	8192
fa	1024	1024	1024	1024
fb	1024	1024	1024	1024
fc	1024	1024	1024	1024
fd	1024	1024	1024	1024
fe	1024	1024	1024	1024
ff	1024	1024	1024	1024
fg	1024	1024	1024	1024
fh	1024	1024	1024	1024

Table A-5 Parameter Values for USP V Disk Types (5/5) (continues on following page)

Parameter		Disk Type			
		OPEN-8	OPEN-8*n (n = 2 to 36)	OPEN-8 VIR	OPEN-8*n VIR (n = 2 to 36)
ty	Disk category	winchester	winchester	winchester	winchester
dt	Control type	SCSI	SCSI	SCSI	SCSI
ns	sectors/tracks	96	96	96	116
nt	tracks/cylinder	15	15	15	15
nc	Number of all cylinders	9966	9966*n	Depends on CV configuration	Depends on CV configuration
rm	Number of rotations of the disk	6300	6300	6300	6300
oa	a partition offset (Starting block in a partition)	Set optionally	Set optionally	Set optionally	Set optionally
ob	b partition offset (Starting block in b partition)	Set optionally	Set optionally	Set optionally	Set optionally
oc	c partition offset (Starting block in c partition)	0	0	0	0
od	d partition offset (Starting block in d partition)	Set optionally	Set optionally	Set optionally	Set optionally
oe	e partition offset (Starting block in e partition)	Set optionally	Set optionally	Set optionally	Set optionally
of	f partition offset (Starting block in f partition)	Set optionally	Set optionally	Set optionally	Set optionally
og	g partition offset (Starting block in g partition)	Set optionally	Set optionally	Set optionally	Set optionally
oh	h partition offset (Starting block in h partition)	Set optionally	Set optionally	Set optionally	Set optionally
pa	a partition size	Set optionally	Set optionally	Set optionally	Set optionally
pb	b partition size	Set optionally	Set optionally	Set optionally	Set optionally
pc	c partition size	14351040	14351040*n	Depends on CV configuration	Depends on CV configuration
pd	d partition size	Set optionally	Set optionally	Set optionally	Set optionally
pe	e partition size	Set optionally	Set optionally	Set optionally	Set optionally
pf	f partition size	Set optionally	Set optionally	Set optionally	Set optionally
pg	g partition size	Set optionally	Set optionally	Set optionally	Set optionally
ph	h partition size	Set optionally	Set optionally	Set optionally	Set optionally
ba	a partition block size	8192	8192	8192	8192
bb	b partition block size	8192	8192	8192	8192
bc	c partition block size	8192	8192	8192	8192

Table A-5 Parameter Values for USP V Disk Types (5/5) (continued)

Parameter		Disk Type			
		OPEN-8	OPEN-8*n (n = 2 to 36)	OPEN-8 VIR	OPEN-8*n VIR (n = 2 to 36)
bd	d partition block size	8192	8192	8192	8192
be	e partition block size	8192	8192	8192	8192
bf	f partition block size	8192	8192	8192	8192
bg	g partition block size	8192	8192	8192	8192
bh	h partition block size	8192	8192	8192	8192
fa	a partition fragment size	1024	1024	1024	1024
fb	b partition fragment size	1024	1024	1024	1024
fc	c partition fragment size	1024	1024	1024	1024
fd	d partition fragment size	1024	1024	1024	1024
fe	e partition fragment size	1024	1024	1024	1024
ff	f partition fragment size	1024	1024	1024	1024
fg	g partition fragment size	1024	1024	1024	1024
fh	h partition fragment size	1024	1024	1024	1024

.

B

Online Device Installation

After initial installation and configuration of the USP V system with the Tru64 UNIX host system, additional disk devices can be installed and deinstalled online without having to restart the system. This section provides instructions for installing and configuring new USP V disk devices in an existing USP V system without rebooting the Tru64 UNIX system.

Note: For additional instructions on online installation and deinstallation of devices, refer to Hitachi Universal Storage Platform V LUN Manager User's Guide (MK-96RD615).

Note: If a new fibre-channel connection is being installed, you must use the normal disruptive device configuration procedure. New fibre-channel connections can only be installed when the host system is powered off. *New* devices under existing fibre-channel ports can be installed and configured nondisruptively.

To perform online *device* installation and configuration:

1. Verify that the new devices on the USP V system are ready to be configured. The Hitachi Data Systems representative should have completed hardware installation and verified the normal status of the new devices (see Preparing for the USP V Installation).
2. Be sure you are logged in as **root**.
3. Perform online device recognition as shown in Figure B-1. These commands enable the Tru64 UNIX system to recognize the newly added disk devices without rebooting. You can also use the **hwmgr –scan scsi** command on Tru64 UNIX 5.x systems as shown in Figure B-2. This command automatically creates the device files for the new device.
4. Verify that the Tru64 UNIX system recognizes the new devices (see Verifying the Device Files).

5. Configure the new USP V devices for Tru64 UNIX operations (Chapter 3): device files, queue depth, register disk types, partition label, file systems, mount directories, mounting and verifying, and auto-mount parameters.
6. Configure the host/application failover, path failover, and/or SNMP software on the Tru64 UNIX system as needed to recognize the new devices.

```
# scsimgr -scan_all
# sizer -n test    ← test,test.devs. will be made on /tmp.
# cd /tmp          ← Go to the tmp directory.
# vi test.devs     ← Add /dev/ to head of test.devs file.
# chmod +x test.devs      ← Add executable attribute to test.devs file.
# cd /dev          ← Go to the dev directory.
# /tmp/test.devs
```

Figure B-1 Online Volume Recognition

```
# hwmgr -view devices
 HWID: Device Name          Mfg      Model            Location
 ------------------------------------------------------------------------------
    3: scp                           (unknown)        (unknown)
    4: /dev/kevm
   54: /dev/disk/floppy0c            3.5in floppy     fdi0-unit-0
   58: /dev/disk/cdrom0c    DEC      RRD46   (C) DEC  bus-0-targ-5-lun-0
   59: /dev/disk/dsk0c      DEC      RZ1CB-CA (C) DEC bus-2-targ-1-lun-0
   60: /dev/disk/dsk1c      DEC      RZ1CB-CA (C) DEC bus-2-targ-3-lun-0
   61: /dev/disk/dsk2c      DEC      RZ1CB-CA (C) DEC bus-2-targ-5-lun-0
   62: /dev/ntape/tape0     DEC      TLZ09     (C)DEC bus-0-targ-6-lun-0
  129: /dev/dmapi/dmapi
  230: /dev/disk/dsk166c    HITACHI  OPEN-3           bus-1-targ-0-lun-0
  231: /dev/disk/dsk167c    HITACHI  OPEN-3           bus-1-targ-0-lun-1
  232: /dev/disk/dsk168c    HITACHI  OPEN-3           bus-1-targ-0-lun-2
  233: /dev/disk/dsk169c    HITACHI  OPEN-3           bus-1-targ-0-lun-3
  234: /dev/disk/dsk170c    HITACHI  OPEN-3           bus-1-targ-0-lun-4
  235: /dev/disk/dsk171c    HITACHI  OPEN-3           bus-1-targ-0-lun-5
  236: /dev/disk/dsk172c    HITACHI  OPEN-3           bus-1-targ-0-lun-6
  237: /dev/disk/dsk173c    HITACHI  OPEN-3           bus-1-targ-0-lun-7
# hwmgr -scan scsi
hwmgr: Scan request successfully initiated
# hwmgr -view devices
 HWID: Device Name          Mfg      Model            Location
 ------------------------------------------------------------------------------
    3: scp                           (unknown)        (unknown)
    4: /dev/kevm
   54: /dev/disk/floppy0c            3.5in floppy     fdi0-unit-0
   58: /dev/disk/cdrom0c    DEC      RRD46   (C) DEC  bus-0-targ-5-lun-0
   59: /dev/disk/dsk0c      DEC      RZ1CB-CA (C) DEC bus-2-targ-1-lun-0
   60: /dev/disk/dsk1c      DEC      RZ1CB-CA (C) DEC bus-2-targ-3-lun-0
   61: /dev/disk/dsk2c      DEC      RZ1CB-CA (C) DEC bus-2-targ-5-lun-0
   62: /dev/ntape/tape0     DEC      TLZ09     (C)DEC bus-0-targ-6-lun-0
  129: /dev/dmapi/dmapi
  230: /dev/disk/dsk166c    HITACHI  OPEN-3           bus-1-targ-0-lun-0
  231: /dev/disk/dsk167c    HITACHI  OPEN-3           bus-1-targ-0-lun-1
  232: /dev/disk/dsk168c    HITACHI  OPEN-3           bus-1-targ-0-lun-2
  233: /dev/disk/dsk169c    HITACHI  OPEN-3           bus-1-targ-0-lun-3
  234: /dev/disk/dsk170c    HITACHI  OPEN-3           bus-1-targ-0-lun-4
  235: /dev/disk/dsk171c    HITACHI  OPEN-3           bus-1-targ-0-lun-5
  236: /dev/disk/dsk172c    HITACHI  OPEN-3           bus-1-targ-0-lun-6
  237: /dev/disk/dsk173c    HITACHI  OPEN-3           bus-1-targ-0-lun-7
  238: /dev/disk/dsk174c    HITACHI  OPEN-3           bus-1-targ-0-lun-8
```

Figure B-2 Online Volume Recognition Using the hwmgr Command

Acronyms and Abbreviations

AdvFS	advanced file system
AL-PA	arbitrated-loop physical address
CV	custom volume
CVS	custom volume size
ESCON®	Enterprise System Connection (IBM® trademark for optical channels)
ExSA™	Extended Serial Adapter™
FC	fibre channel
FCA	fibre-channel adapter
HP	Hewlett Packard Corporation
Gbps	gigabits per second
HBA	host bus adapter
I/O, IO	input/output
LDEV	logical device
LU	logical unit
LUN	logical unit number
LUSE	LUN Expansion
LVI	logical volume image
MB	megabytes
OFC	open fibre control
OS	operating system
PC	personal computer system
RAID	redundant array of independent disks
RCU	remote control unit (used for Hitachi TrueCopy operations)
R-SIM	remote service information message
r/w	read/write

SCSI	small computer system interface
SIM	service information message
SNMP	simple network management protocol
SVP	service processor
TID	target ID
UFS	UNIX file system
VLL	Virtual LVI/LUN
WWN	worldwide name

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MK-96RD654-02