

HP StorageWorks

Modular Smart Array 1500 cs application note

Migrating to active/active controllers in HP-UX environments



400677-001

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i n v e n t

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Modular Smart Array 1500 cs application note - Migrating to active/active controllers in HP-UX environments

About this document

This guide provides information about migrating existing HP-UX® MSA1500 cs installations from a single-controller, active/standby configuration to a dual-controller, active/active configuration.

Major topics include:

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- [Upgrading the MSA](#), page 6
- [Verifying SAN connectivity](#), page 9
- [Configuring the redundant path](#), page 10
- [Troubleshooting](#), page 13

Intended audience

This guide is intended for HP-UX administrators and technicians who have experience with:

- HP-UX 11i v1 and HP-UX 11i v2 (32-bit or 64-bit systems)
- HP-UX Logical Volume Manager (LVM), including LVM Alternate Paths (PVLinks)
- HP-UX 11i v1 and HP-UX 11 v2 Serviceguard Clustering
- HP Disk Monitoring software
- HP StorageWorks Modular Smart Array product line, SAN infrastructures, and SAN switch fabrics

HP technical support

Telephone numbers for worldwide technical support are listed on the HP support web site: <http://www.hp.com/support/>.

Collect the following information before calling:

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

Accessing future product updates

HP strongly recommends that customers sign up online using the Subscriber's choice web site: <http://www.hp.com/go/e-updates>.

- Subscribing to this service provides you with e-mail updates on the latest product enhancements, newest versions of drivers, and firmware documentation updates as well as instant access to numerous other product resources.
- After signing up, you can quickly locate your products by selecting **Business support** and then **Storage** under Product Category.

Related documentation

In addition to this guide, please refer to other documents for this product:

- *HP StorageWorks Modular Smart Array 1500 cs Configuration Overview poster*
- *HP StorageWorks Modular Smart Array 1500 cs Installation Guide* (September 2005 or later)
- *HP StorageWorks Modular Smart Array 1000/1500 cs Command Line Interface User Guide*
- *HP StorageWorks Modular Smart Array 1000/1500 cs Firmware Upgrade Guide*
- *HP StorageWorks Modular Smart Array 1500 cs Maintenance and Service Guide*

Additional documentation, including whitepapers and best-practices documents, is available on the HP web site: <http://www.hp.com>.

Overview

This document outlines the required steps to migrate existing HP-UX MSA1500 cs environments from a single-controller MSA1500 cs using active/standby controller firmware to a dual-controller MSA1500 cs using active/active controller firmware.

Active/active feature set:

- Supports simultaneous I/O processing on the controllers, providing better performance as well as high availability. (I/O can be processed simultaneously by both controllers, but the LUNs are owned by only one controller at any given time.)
- Supports explicit controller ownership, using both the MSA Command Line Interface (CLI) and HP-UX PVLinks.
- Supports implicit LUN failover to the other controller for optimized I/O processing.


Active/active limitations:

- The MSA supports a maximum of 32 LUNs.
- PVLinks supports a maximum of 8 paths per LUN.

Preparing for the migration

 **NOTE:** Before proceeding with the upgrade, you must understand the following:

- During the migration process:
 - Do not move from a direct-connect configuration to a switched-fabric connection.
 - Do not move the target Fibre Channel cable from one port on a fabric switch to another port.
 - Do not change the switch domain.
 - Currently installed MSA controller firmware must be 4.94 or later.
 - Single-controller configurations are no longer supported; two controllers must be installed in the MSA.
-

 **CAUTION:** A full backup of the HP-UX operating system files and data volumes is highly recommended before starting the upgrade process. HP is not responsible for data loss incurred during the upgrade process.

Step	Description	Check
1	Review or obtain the following documents on the MSA1500 cs web site (http://www.hp.com/go/msa1500cs): <ul style="list-style-type: none">• MSA1500 cs Quick Specs• MSA1500 cs Compatibility Matrix• MSA1000/1500 cs Command Line Interface User Guide	<input type="checkbox"/>
2	Obtain the latest MSA1500 cs active/active controller firmware files (version 6.0 or later) and MSA1000/1500 cs firmware upgrade guide. Go to the MSA1500 cs web site http://www.hp.com/go/msa1500cs , and then click Software, firmware & drivers .	<input type="checkbox"/>
3	Backup the OS and data volumes.	<input type="checkbox"/>
4	Verify successful backup of OS and data volumes.	<input type="checkbox"/>
5	Review the latest list of supported servers, HBA models, HBA drivers, and HP-UX operating system versions and patch kits as listed on the MSA1500 cs Compatibility Matrix on the MSA1500 cs web site: http://www.hp.com/go/msa1500cs .	<input type="checkbox"/>

Step	Description (continued)	Check
6	Document and diagram the existing switch fabric configuration.	<input type="checkbox"/>
7	Record existing device file names and Fibre Channel HBA hardware paths of servers. (This information is required to verify the LVM configuration after the firmware upgrade process is complete.) From the server console, enter: ioscan -fnk	<input type="checkbox"/>
8	Record the World Wide Name (WWPN) of the Fibre Channel HBA connected to the MSA. (This information is required to setup host connections to the MSA and to verify the configuration after the firmware upgrade process is complete.) Depending on the installed HBA, enter one of the following from the server console: fcmsutil <fcd device file> - or - fcdutil <fcd device file>	<input type="checkbox"/>
9	View and record the current configuration of all hard drives and associated LUNs. From the MSA Command Line Interface (CLI), enter show tech_support	<input type="checkbox"/>
10	Create backup copies of HP-UX configuration files, including: <ul style="list-style-type: none"> • lvmstab • fstab • volume group 	<input type="checkbox"/>
11	If needed, install additional supported HP Fibre Channel HBAs in the server.	<input type="checkbox"/>
12	Verify that the supported HBA drivers, EFI drivers, and ROM firmware are installed, as listed on the MSA1500 cs Compatibility Matrix on the MSA1500 cs web site: http://www.hp.com/go/msa1500cs . To see the currently-installed driver versions, depending on the installed HBA, enter one of the following from the server console: fcmsutil <fcd device file> vpd - or - fcdutil <fcd device file> vpd If needed, obtain updated HBA drivers and firmware from the HP web site: http://www.software.hp.com .	<input type="checkbox"/>

Upgrading the MSA

Step	Description	Check
1	Notify all system administrators of units connected to the MSA SAN fabric that the disk array will temporarily be offline.	<input type="checkbox"/>
2	Power off all <i>production</i> servers attached to the MSA SAN fabric. Do not power off the HP-UX management server.	<input type="checkbox"/>
3	Upgrade the firmware on the MSA controller and any attached MSA20 storage enclosures using the MSA CLI download firmware command as outlined in the MSA1000/1500 cs firmware upgrade guide. NOTE: Before starting the upgrade process, ensure that the MSA has a fiber link to the fabric.	<input type="checkbox"/>
4	Power cycle the MSA and all attached storage enclosures in the following sequence: IMPORTANT: Do not deviate from this power-cycle sequence. If the MSA and the storage enclosures are power-cycled out of order, LUNs will be marked as failed and must be re-enabled. <ul style="list-style-type: none"> a. Press and hold down the MSA Power/Standby button for approximately five seconds to place the MSA in Standby mode. b. Power off all storage enclosures attached to the MSA. c. Wait approximately two minutes to ensure that the hard disk drives stop rotating. d. Restart all storage enclosures attached to the MSA. e. Wait approximately four minutes to allow the enclosures to complete their power-on routine. f. Press and release the MSA Power/Standby button to restart the MSA. g. Wait until the <code>MSA STARTUP COMPLETE</code> message is displayed on the controller LCD panel. 	<input type="checkbox"/>
5	Verify that the firmware upgrade completed successfully and the storage is visible. From the MSA CLI enter the following commands: <ul style="list-style-type: none"> • show version—Displays MSA version information, including MSA firmware and MSA hardware build. • show disks—Displays physical disk information, including disk number, enclosure box and bay number, enclosure bus number and ID, physical disk size, and Logical Units (LUNs) to which the disk is assigned. • show units—Displays LUN information, including LUN name, status, included physical disks and spares, RAID level and capacity. • show this_controller—Displays controller information, including serial number, hardware build, and redundancy mode. NOTE: Displayed information will show the MSA operating in a non-redundant mode. This is normal, because the additional controller is not yet installed. For detailed information about the CLI, see the <i>HP StorageWorks Modular Smart Array 1000/1500 cs Command Line Interface User Guide</i> .	<input type="checkbox"/>
6	Restart all servers attached to the MSA SAN fabric, including the HP-UX management server.	<input type="checkbox"/>

Step	Description (continued)	Check																																										
7	<p>Verify that the storage units are available and the hardware path of the device files did not change.</p> <p>From the server console, enter ioscan -fnC disk</p> <p>Example display:</p> <table border="1" data-bbox="363 352 1361 709"> <thead> <tr> <th>Class</th> <th>I</th> <th>H/W Path</th> <th>Driver</th> <th>S/W State</th> <th>H/W Type</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>disk</td> <td>0</td> <td>0/0/1/1.0.0 /dev/dsk/c1t0d0</td> <td>sdisk</td> <td>CLAIMED</td> <td>DEVICE</td> <td>HP 36.4G MAS /dev/rdisk/c1t0d0</td> </tr> <tr> <td>disk</td> <td>4</td> <td>0/0/2/1.2.0 /dev/dsk/c3t2d0</td> <td>sdisk</td> <td>CLAIMED</td> <td>DEVICE</td> <td>HP DVD-ROM 3 /dev/rdisk/c3t2d0</td> </tr> <tr> <td>disk</td> <td>5</td> <td>0/10/0/0.1.0.0 /dev/dsk/c6t0d0</td> <td>sdisk</td> <td>CLAIMED</td> <td>DEVICE</td> <td>HP MSA VOLUME /dev/rdisk/c6t0d0</td> </tr> <tr> <td>disk</td> <td>6</td> <td>0/10/0/0.1.0.1 /dev/dsk/c6t0d1</td> <td>sdisk</td> <td>CLAIMED</td> <td>DEVICE</td> <td>HP MSA VOLUME /dev/rdisk/c6t0d1</td> </tr> <tr> <td>disk</td> <td>7</td> <td>0/10/0/0.1.0.2 /dev/dsk/c6t0d2</td> <td>sdisk</td> <td>CLAIMED</td> <td>DEVICE</td> <td>HP MSA VOLUME /dev/rdisk/c6t0d2</td> </tr> </tbody> </table>	Class	I	H/W Path	Driver	S/W State	H/W Type	Description	disk	0	0/0/1/1.0.0 /dev/dsk/c1t0d0	sdisk	CLAIMED	DEVICE	HP 36.4G MAS /dev/rdisk/c1t0d0	disk	4	0/0/2/1.2.0 /dev/dsk/c3t2d0	sdisk	CLAIMED	DEVICE	HP DVD-ROM 3 /dev/rdisk/c3t2d0	disk	5	0/10/0/0.1.0.0 /dev/dsk/c6t0d0	sdisk	CLAIMED	DEVICE	HP MSA VOLUME /dev/rdisk/c6t0d0	disk	6	0/10/0/0.1.0.1 /dev/dsk/c6t0d1	sdisk	CLAIMED	DEVICE	HP MSA VOLUME /dev/rdisk/c6t0d1	disk	7	0/10/0/0.1.0.2 /dev/dsk/c6t0d2	sdisk	CLAIMED	DEVICE	HP MSA VOLUME /dev/rdisk/c6t0d2	<input type="checkbox"/>
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8	<p>Verify that all volume groups remain linked to the storage units.</p> <p>From the server console, enter vgdisplay -v /dev/<vgname></p> <p>Example display, using a vgname of <i>/vg06</i>:</p> <pre data-bbox="363 913 970 1827"> Volume groups VG Name /dev/vg06 Logical volumes LV Name /dev/vg06/lvol1 LV Status available/syncd LV Size (Mbytes) 80000 Current LE 20000 Allocated PE 20000 Used PV 3 Physical volumes PV Name /dev/dsk/c6t0d0 PV Status available Total PE 8680 Free PE 0 Autoswitch on PV Name /dev/dsk/c6t0d1 PV Status available Total PE 4997 Free PE 0 Autoswitch on PV Name /dev/dsk/c6t0d2 PV Status available Total PE 2497 Free PE 0 Autoswitch on </pre>	<input type="checkbox"/>																																										

Step	Description (continued)	Check
9	<p>Install the additional MSA array controller.</p> <ul style="list-style-type: none"> • Before installing the additional array controller, ensure that both controllers have the same cache size installed. • Install the array controller using instructions shipped with the controller. • After installing the additional array controller: <ul style="list-style-type: none"> • Allow the auto-cloning process to compare the firmware on the two controllers and clone the firmware from the previously-updated controller to the just-installed controller. • Wait for the cloning process to complete, the just-installed controller to automatically restart, and <code>MSA STARTUP COMPLETE</code> to display on the controller LCD panel. 	<input type="checkbox"/>
10	<p>Verify that both MSA controllers are running the same version of firmware, and examine the status of the MSA, the storage, and the connections.</p> <p>From the MSA CLI, enter the following commands:</p> <ul style="list-style-type: none"> • show version—Displays MSA version information, including MSA firmware and MSA hardware build. • show disks—Displays physical disk information, including disk number, enclosure box and bay number, enclosure bus number and ID, physical disk size, and Logical Units (LUNs) to which the disk is assigned. • show units—Displays LUN information, including LUN name, status, included physical disks and spares, RAID level, and LUN capacity. • show this_controller—Displays controller information (for the controller with the serial connection), including serial number, hardware build, and redundancy mode. • show other_controller—Displays controller information (for the controller with no serial connection), including serial number, hardware build, and redundancy mode. • show connections—Displays connection information, including the WWPN of each HBA connected to the MSA and the host mode (or profile) assigned to the connection. • show ac1—Displays the Access Control List (ACL), including the WWPN of the HBAs and the accessible LUNs. <p>NOTE: Displayed information will show the MSA operating in a redundant mode.</p> <p>For detailed information about the CLI, see the <i>HP StorageWorks Modular Smart Array 1000/1500 cs Command Line Interface User Guide</i>.</p>	<input type="checkbox"/>
11	<p>OPTIONAL—Install additional management tools from the HP StorageWorks Modular Smart Array 1000/1500 cs Support Software CD.</p> <ol style="list-style-type: none"> a. Obtain the latest HP StorageWorks Modular Smart Array 1000/1500 cs Support Software CD from the Software, firmware & drivers page of the MSA1500 cs web site: http://www.hp.com/go/msa1500cs. b. Insert the Support Software CD into the CD-ROM drive of the server and install the following components as outlined in the MSA 1000/1500 cs firmware upgrade guide: <ul style="list-style-type: none"> • HP-UX SCSI Command Utility (SCU)—Used for future firmware updates. • ACU-CLI—Used for configuring and managing MSA storage. c. Remove the CD when the installation is complete. 	<input type="checkbox"/>

Verifying SAN connectivity

Step	Description	Check
	<p>For switch fabric SAN connectivity:</p> <ul style="list-style-type: none"> Log on to the switch management utility and verify that the switch fabric is set up properly, including zoning. From the MSA CLI, enter show this_controller to verify that the MSA array controller is configured for switch fabric connectivity. From the MSA CLI, enter show other_controller to verify that the MSA array controller is configured for switch fabric connectivity. <p>Example display:</p> <pre>CLI>show this_controller Controller MSA1500(c) Hewlett-Packard P56350A9IMN01Z Version 6.32 Build 1 Hardware 7 Component Enclosure. Controller Identifier: NODE_ID = 500508B3-00909AA0 SCSI_VERSION = SCSI-3 Supported Redundancy Mode:Active/Standby Asym-Active/Active Current Redundancy Mode:Asym-Active/Active Active/Standby Simulation DISABLED Device Port SCSI address 7 Terminal speed for the CLI is set to 19200. Host Port_1: REPORTED PORT_ID 500508B3-00909AA9 PORT_1_TOPOLOGY = F_Port (Switch Fabric Enabled)</pre>	<input type="checkbox"/>
	<p>For direct connect SAN connectivity:</p> <p>From the MSA CLI of the newly-added controller:</p> <ul style="list-style-type: none"> Enter show this_controller_hard_address to determine if the MSA array controller is configured for direct connect SAN connectivity. Enter set this_controller_hard_address to enable hard addressing on the array controller. <p>Example display when hard addressing is disabled:</p> <pre>CLI>show this_controller_hard_address Hard Addressing is disabled.</pre> <p>Example display of enabling a hard address:</p> <pre>CLI>set this_controller_hard_address enable 10 Hard Addressing is enabled. Loop ID=10, AL-PA=0xD5 Negotiated Two Gig</pre>	<input type="checkbox"/>

Configuring the redundant path

Step	Description	Check
1	Connect the Fibre Channel cable from the Fibre Channel HBA in the server to the port on the HP SAN switch (or MSA Fibre Channel I/O module in direct-connect configurations).	<input type="checkbox"/>
2	Create a new connection table on the disk array. From the server console, enter ioscan -fnC fc	<input type="checkbox"/>
3	Record the World Wide Port Name (WWPN) of the newly added host connection to the MSA. (This information is required to configure a connection name and access the control list on the second controller.) Depending on the installed HBA, enter one of the following from the server console: fcmsutil <fcd device file> -or- fcdutil <fcd device file> Example display, using the fcmsutil command and a device file of <code>/dev/td1</code> : <pre> fcmsutil /dev/td1 Vendor ID is = 0x00103c Device ID is = 0x001029 XL2 Chip Revision No is = 2.3 PCI Sub-system Vendor ID is = 0x00103c PCI Sub-system ID is = 0x00128c Topology = PTTOPT_FABRIC Link Speed = 2Gb Local N_Port_id is = 0x010100 N_Port Node World Wide Name = 0x50060b0000225cB1 N_Port Port World Wide Name = 0x50060b0000225cB0 Driver state = ONLINE Hardware Path is = 10/4/2/0 Number of Assisted IOs = 86 Number of Active Login Sessions = 0 Dino Present on Card = NO Maximum Frame Size = 2048 Driver Version = @(##) libtd.a HP Fibre Channel Tachyon XL2 Driver B.11.23.03 /ux/core/isu/TL/kern/src/common/wsio/td_glue.c: Aug 16 2000 </pre>	<input type="checkbox"/>
4	Verify that there is a connection from the MSA controller to the server HBA, and that the host WWPN is the same as the WWPN of the HP-UX server. From the CLI of the second controller, enter show connections Example display: <pre> CLI>show connections Connection Name: HBA1 Host WWNN=20000000-C93673BA Host WWPNN=10000000-C93673BA Profile Name=hp Connection Name: <Unknown> Host WWNN=50060B00-00225CB1 Host WWPNN=50060B00-00225CB0 Profile Name=default </pre> The connection to the second controller displays default settings.	<input type="checkbox"/>

Step	Description (continued)	Check
5	<p>Assign a name and profile type to the connection (the additional HBA connected to the second MSA array controller.)</p> <p>From the CLI, enter add connection <name> WWPN=<WWPN> profile=<type></p> <p>Example display, assigning a connection name of <i>HBA2</i>:</p> <pre> CLI>add connection HBA2 WWPN=50060B00-00225CB0 profile=hp Connection has been added successfully. Profile hp is set to the new connection. </pre>	<input type="checkbox"/>
6	<p>Verify the connection.</p> <p>From the CLI, enter show connections</p> <p>Example display:</p> <pre> CLI>show connections Connection Name: HBA1 Host WWNN=20000000-C93673BA Host WWPN=10000000-C93673BA Profile Name=hp Connection Name: HBA2 Host WWNN=50060B00-00225CB1 Host WWPN=50060B00-00225CB0 Profile Name=hp </pre>	<input type="checkbox"/>
7	<p>Grant the new controller access to the storage.</p> <p>From the CLI, enter add acl connection=<connection name> unit=<LUNs></p> <p>Example display, granting connection <i>HBA2</i> access to LUNs <i>0, 1, and 2</i>:</p> <pre> CLI>add acl connection=HBA2 unit=0 1 2 Enabling ACL. Allowing 50060B00-00225CB0 access to unit 0 1 2. </pre>	<input type="checkbox"/>
8	<p>Verify the changes to the access control list.</p> <p>From the CLI, enter show acl</p> <p>Example display:</p> <pre> CLI>show acl Connection WWPN Units HBA1 10000000-C93673BA 0, 1, 2 HBA2 50060B00-00225CB0 0, 1, 2 </pre>	<input type="checkbox"/>
9	<p>Verify the newly added redundancy.</p> <p>From the server console, enter ioscan -fnC disk</p>	<input type="checkbox"/>
10	<p>Create block and character device files for each storage unit.</p> <p>From the server console, enter insf -e</p>	<input type="checkbox"/>

Step	Description (continued)	Check																																																	
11	<p>Review the display of all claimed storage units linked to each physical path.</p> <p>From the server console, enter ioscan -fnC disk</p> <p>Example display:</p> <table border="1" data-bbox="316 323 1300 737"> <thead> <tr> <th>Class</th> <th>I</th> <th>H/W Path</th> <th>Driver</th> <th>S/W State</th> <th>H/W Type</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>disk</td> <td>5</td> <td>0/10/0/0.1.0.0.0.0.0 /dev/dsk/c6t0d0</td> <td>sdisk</td> <td>CLAIMED</td> <td>DEVICE</td> <td>HP MSA VOLUME /dev/rdisk/c6t0d0</td> </tr> <tr> <td>disk</td> <td>6</td> <td>0/10/0/0.1.0.0.0.0.1 /dev/dsk/c6t0d1</td> <td>sdisk</td> <td>CLAIMED</td> <td>DEVICE</td> <td>HP MSA VOLUME /dev/rdisk/c6t0d1</td> </tr> <tr> <td>disk</td> <td>7</td> <td>0/10/0/0.1.0.0.0.0.2 /dev/dsk/c6t0d2</td> <td>sdisk</td> <td>CLAIMED</td> <td>DEVICE</td> <td>HP MSA VOLUME /dev/rdisk/c6t0d2</td> </tr> <tr> <td>disk</td> <td>184</td> <td>0/12/0/0.1.0.0.0.0.0 /dev/dsk/c22t0d0</td> <td>sdisk</td> <td>CLAIMED</td> <td>DEVICE</td> <td>HP MSA VOLUME /dev/rdisk/c22t0d0</td> </tr> <tr> <td>disk</td> <td>185</td> <td>0/12/0/0.4.0.0.0.0.1 /dev/dsk/c22t0d1</td> <td>sdisk</td> <td>CLAIMED</td> <td>DEVICE</td> <td>HP MSA VOLUME /dev/rdisk/c22t0d1</td> </tr> <tr> <td>disk</td> <td>186</td> <td>0/12/0/0.4.0.0.0.0.2 /dev/dsk/c22t0d2</td> <td>sdisk</td> <td>CLAIMED</td> <td>DEVICE</td> <td>HP MSA VOLUME /dev/rdisk/c22t0d2</td> </tr> </tbody> </table>	Class	I	H/W Path	Driver	S/W State	H/W Type	Description	disk	5	0/10/0/0.1.0.0.0.0.0 /dev/dsk/c6t0d0	sdisk	CLAIMED	DEVICE	HP MSA VOLUME /dev/rdisk/c6t0d0	disk	6	0/10/0/0.1.0.0.0.0.1 /dev/dsk/c6t0d1	sdisk	CLAIMED	DEVICE	HP MSA VOLUME /dev/rdisk/c6t0d1	disk	7	0/10/0/0.1.0.0.0.0.2 /dev/dsk/c6t0d2	sdisk	CLAIMED	DEVICE	HP MSA VOLUME /dev/rdisk/c6t0d2	disk	184	0/12/0/0.1.0.0.0.0.0 /dev/dsk/c22t0d0	sdisk	CLAIMED	DEVICE	HP MSA VOLUME /dev/rdisk/c22t0d0	disk	185	0/12/0/0.4.0.0.0.0.1 /dev/dsk/c22t0d1	sdisk	CLAIMED	DEVICE	HP MSA VOLUME /dev/rdisk/c22t0d1	disk	186	0/12/0/0.4.0.0.0.0.2 /dev/dsk/c22t0d2	sdisk	CLAIMED	DEVICE	HP MSA VOLUME /dev/rdisk/c22t0d2	<input type="checkbox"/>
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disk	184	0/12/0/0.1.0.0.0.0.0 /dev/dsk/c22t0d0	sdisk	CLAIMED	DEVICE	HP MSA VOLUME /dev/rdisk/c22t0d0																																													
disk	185	0/12/0/0.4.0.0.0.0.1 /dev/dsk/c22t0d1	sdisk	CLAIMED	DEVICE	HP MSA VOLUME /dev/rdisk/c22t0d1																																													
disk	186	0/12/0/0.4.0.0.0.0.2 /dev/dsk/c22t0d2	sdisk	CLAIMED	DEVICE	HP MSA VOLUME /dev/rdisk/c22t0d2																																													
12	<p>Verify that the device file names are linked to <vgname>.</p> <p>From the server console, enter vgdisplay -v /dev/<vgname></p> <p>Example display, using a vgname of /vg06:</p> <pre data-bbox="316 945 1197 1858"> Volume groups VG Name /dev/vg06 Logical volumes LV Name /dev/vg06/lvol1 LV Status available/syncd LV Size (Mbytes) 80000 Current LE 20000 Allocated PE 20000 Used PV 3 Physical volumes PV Name /dev/dsk/c6t0d0 (linked to primary path) PV Status available Total PE 8680 Free PE 0 Autoswitch on PV Name /dev/dsk/c6t0d1 (linked to primary path) PV Status available Total PE 4997 Free PE 0 Autoswitch on PV Name /dev/dsk/c6t0d2 (linked to primary path) PV Status available Total PE 2497 Free PE 0 Autoswitch on </pre>	<input type="checkbox"/>																																																	

Step	Description (continued)	Check
13	<p>If using PVLinks, add an alternate link to each physical volume in the volume group.</p> <p>For example:</p> <ul style="list-style-type: none"> To add an alternate link to <code>/dev/dsk/c6t0d0</code>, enter: <code>vgextend /dev/vg06 /dev/dsk/c22t0d0</code> To add an alternate link to <code>/dev/dsk/c6t0d1</code>, enter: <code>vgextend /dev/vg06 /dev/dsk/c22t0d1</code> To add an alternate link to <code>/dev/dsk/c6t0d2</code>, enter: <code>vgextend /dev/vg06 /dev/dsk/c22t0d2</code> 	<input type="checkbox"/>
14	<p>Ensure that the preferred path in the MSA for the LUNs is the same as the primary PVLinks path.</p> <ul style="list-style-type: none"> In PVLinks, use the following command: <code>vgdisplay -v /dev/<vgname></code> In the MSA CLI, use the following command: <code>show preferred_path <this_controller/other_controller></code> If the preferred path of the MSA LUNs is not the same as the PVLinks primary path, change the MSA path. In the MSA CLI, use the following command: <code>set preferred_path <this_controller/other_controller></code> 	<input type="checkbox"/>

Troubleshooting

To display and verify the status of a volume group, from the server console, enter:

```
vgdisplay -v /dev/vgname
```

To activate a volume group, from the server console, enter:

```
vgchange -a /dev/vgname
```

To verify that device filenames and hardware paths did not change, from the server console, enter:

```
ioscan -fnC disk
```

To verify that the connection is properly set for all HP-UX HBAs (profile=hp). from the MSA CLI, enter:

```
show connections
```

To verify that hard addressing has been set on direct-connect MSA controllers, from the MSA CLI, enter:

```
show this_controller_hard_address
```

To verify that access is granted to the LUNs on each MSA array controller, from the MSA CLI, enter:

```
show acl
```

