

SAN Host Attach Kit 1.0 for Fibre Channel Protocol on HP-UX®

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Updates to the SAN Host Attach Kit 1.0 for Fibre Channel on HP-UX

What this document describes

This document describes new components and features supported by the SAN Host Attach Kit 1.0 for Fibre Channel on HP-UX. The new hardware and features are tested and qualified by NetApp as of February, 2005.

New OS versions, hardware, and clustering, components

The SAN Host Attach Kit 1.0 now supports the following hardware components and OS versions:

- ◆ HP-UX 11i v2 September 2004 on PA-RISC systems
- ◆ HP-UX 11i v1 December 2004 Patch Bundles
- ◆ A9784A combo PCI-X FC/GbE HBA
- ◆ Support for HP Serviceguard clusters with more than two nodes

New features qualified

The SAN Host Attach Kit 1.0 supports the following HP-UX features:

SAN booting: SAN booting is using a SAN-attached disk, such as a NetApp LUN, as a boot device for a host. SAN booting provides the following advantages:

- ◆ You can remove the hard drives from your servers and use the SAN for your boot needs, thereby eliminating the costs associated with maintaining and servicing hard drives.
- ◆ Consolidation and centralization—The host uses the SAN for both storage and boot needs.

For detailed information about SAN booting, see “[Configuring SAN booting](#)” on page 3.

nPar and vPar partitioning: The SAN Host Attach Kit 1.0 supports nPAR and vPAR partitioning.

- ◆ nPARS are hard partitions. You can configure a server as a single large system or as multiple smaller systems by defining one or more cells that contain processors and memory. Each cell is assigned to an nPAR. Each nPAR is like a smaller system that runs its own version of the OS

- ◆ vPARS are software based partitions that enable you to run multiple instances of HP-UX 11i simultaneously on a single server or within one nPAR. Each instance can host its own set of applications.

Note

vPars are available only on the HP servers and operating systems that support them. See the HP OS documentation to see the types of partitioning that are supported for your OS.

You can use this partitioning to run multiple instances of the SAN Host Attach Kit 1.0 on a single physical server. For example, you can configure multiple nPARs on a single physical server and then configure multiple vPARs within a single nPAR. Each vPAR runs its own instance of HP-UX. You can then install and configure an instance of the SAN Host Attach Kit 1.0 on each instance of HP-UX.

For information about configuring nPARs and vPARs, see the HP documentation for your system. There are no special procedures required on the NetApp storage appliance to support these types of partitions.

HP-UX Online Add and Replace (OLAR): The SAN Host Attach Kit 1.0 supports the HP-UX Online Add and Replace (OLAR) capability. OLAR enables you to replace, remove and add HBAs without having to shut down or reboot the host to perform the procedure.

You can use the OLAR capability with any HP system and HBA that supports OLAR, provided the HBA is also supported by the SAN Host Attach Kit 1.0. For detailed information about OLAR procedures and tools (for example, using SAM, rad, or olrad) see the HP documentation for your OS.

Before you begin an add or replacement procedure, make sure that the WWPN(s) of the new or replacement HBA are added to an igroup that is mapped to the NetApp LUNs accessed by the host. For information about creating igroups and mapping them to a LUN, see the *Installation and Setup Guide* for the SAN Host Attach Kit 1.0 for Fibre Channel on HP-UX.

There are no other special considerations for using OLAR in a NetApp SAN environment.

Configuring SAN booting

Methods for creating a bootable SAN LUN

This section describes procedure examples for the following methods for creating a bootable SAN LUN.

- ◆ Migrating an existing system disk using the HP MirrorDisk/UX tool
- ◆ Scratch installing the HP-UX OS on a boot LUN using an HP Ignite Server or an installation CD-ROM

The procedures in this section assume the following:

- ◆ The host is booting from an existing internal OS disk. It is not a diskless server.
- ◆ The SAN Host Attach Kit 1.0 for HP-UX software is installed on the host. The Attach Kit software contains the following tools, which you need for managing paths to the boot LUN. These tools are located in the `/opt/NetApp/santools/bin` directory.
 - ❖ `sanlun`—You use the `sanlun` tool to determine which storage device represents the boot LUN and to list the paths to that device.
 - ❖ `ntap_config_paths`—You use the `ntap_config_paths` tool to add missing paths to the volume groups containing the NetApp LUN and reorder the paths if necessary.

Note

These procedures are intended as examples or guidelines for creating a bootable SAN LUN. There are other methods for creating a bootable SAN LUN that are not described in this document. For example, you can migrate an existing system disk to a NetApp LUN without the MirrorDisk/UX tool by using `cpio` and `boot` device commands. You can also configure a diskless server to boot from a NetApp LUN. For more details, see the documentation for your version of HP-UX.

For detailed information

For detailed information about creating a bootable SAN LUN, see the following sections:

- ◆ [“Creating the boot LUN”](#) on page 4
- ◆ [“Migrating an existing OS disk by using MirrorDisk/UX”](#) on page 11, or:
- ◆ [“Installing the OS by using an Ignite Server or installation CD-ROM”](#) on page 18
- ◆ [“Testing the alternate boot path”](#) on page 22

Configuring SAN booting

Creating the boot LUN

Determining the size of the boot LUN

If you are installing the OS on the boot LUN: Create a LUN that is large enough to provide enough space for the version of HP-UX you are using. For details, see the documentation for your version of HP-UX.

If you are mirroring an existing host boot disk: Create a LUN that is at least as large as the allocated space used by the existing system boot disk. To determine the size of the system boot disk complete the following steps.

Step	Action
1	On the host, use the <code>vgdisplay</code> command to obtain information about the root volume group (vg00) and determine which disk is used as the system OS disk. <pre>vgdisplay -v vg00</pre> Result : The output under <code>Physical volumes</code> shows the paths to the system disk. Example: The following example shows the path to the system disk. <pre>--- Physical volumes --- PV Name /dev/dsk/clt15d0 PV Status available Total PE 4340 Free PE 2136 Autoswitch On</pre>

Step	Action
2	On the host, use the <code>diskinfo</code> command to display the size of the system disk: <pre>diskinfo /dev/rdisk/raw_device_node</pre> <code>raw_device_node</code> is the system disk device in <code>Physical volumes</code> section in the output of the <code>vgdisplay</code> command you used in Step 1. Example: The following example shows that the size of the system disk is approximately 18 GB. Your boot LUN must be at least 18 GB. <pre>diskinfo /dev/rdisk/clt15d0 SCSI describe of /dev/rdisk/clt15d0: vendor: HP 18.2G product id: MAN3184MC type: direct access size: 17783240 Kbytes bytes per sector: 512</pre>

Configuring the NetApp igroup and boot LUN

After you determine the size of the boot LUN, create the boot LUN on the NetApp storage appliance, map it to an igroup, and assign it a LUN ID.

Creating the igroup: To create the igroup, complete the following steps. If you already have an existing HP-UX igroup that contains the WWPNs of the host's HBAs, proceed to "[Creating the boot LUN](#)" on page 8.

Step	Action
1	Log in as root on the host.

Step	Action
2	Get the WWPN for each of the host's HBAs by entering the following <code>sanlun</code> command. The <code>sanlun</code> command is in the <code>/opt/NetApp/santools/bin</code> directory. <pre>sanlun fcp show adapter -c</pre> Result: The <code>-c</code> option tells the <code>sanlun</code> command to generate on the host console a complete <code>igroup create</code> command that includes the host's WWPNs. The <code>igroup</code>'s name in the <code>igroup create</code> command matches the name of the host. You can copy this command from the host console and use it to create the <code>igroup</code> in Step 4. Example: The <code>sanlun fcp show adapter -c</code> command produces the following output on the console of an HP-UX system called <code>boothost</code>. This example uses two WWPNs. Enter this filer command to create an initiator group for this system: <pre>igroup create -f -t hpux "boothost" 50060b000010a700 50060b000010a606</pre> Because the name of the host is "boothost," this command line produces an <code>igroup</code> called "boothost."
3	On the host in a different session, use the <code>telnet</code> command to access the NetApp storage appliance.
4	Copy the <code>igroup create</code> command from Step 2. Example: If you use the information in Step 2, you would copy the following command line: <pre>igroup create -f -t hpux "boothost" 50060b000010a700 50060b000010a606</pre>
5	Paste the command on the storage appliance command line and press Enter. Result: The storage appliance creates the <code>igroup</code> and gives it the same name as the host name.

Step	Action
6	On the storage appliance command line, verify that the new igroup is created by entering the following command: <pre>igroup show</pre> Result: The console displays the newly created igroup with the host's WWPNs. Example: The following is output from the igroup show command displays. <pre>netapp_1> igroup show -v boothost boothost (FCP): OS Type: hpux Member: 50:06:0b:00:00:10:a7:00 Member: 50:06:0b:00:00:10:a6:06</pre>

Creating the boot LUN: To create the boot LUN, complete the following steps:

Step	Action
1	On the storage appliance command line, enter the following command: <pre>lun create -s <i>size</i> -t <i>ostype</i> <i>lun-path</i></pre> <i>size</i> is the size of the LUN, which you obtained in “Determining the size of the boot LUN” on page 4. You can use one of the following characters to establish the size: c (bytes), w (words or double bytes), b (512), k (kilobytes), m (megabytes), g (gigabytes), t (terabytes). -t <i>ostype</i> indicates the type of operating system running on the host that accesses the boot LUN. Enter hpux. <i>lun-path</i> is the LUN’s path name that includes the volume and qtree. Example: <pre>lun create -s 18g -t hpux /vol/bootvol/bootlun1</pre>
2	Enter the following command to map the LUN to the initiator group. <pre>lun map <i>lun-path</i> <i>igroup-name</i> <i>LUN-ID</i></pre> <i>lun-path</i> is the path name of the LUN you created. <i>igroup-name</i> is the name of the initiator group you created. <i>LUN-ID</i> is the identification number that you specify. The host associates the LUN ID with the location and path name of the LUN. If you do not specify a LUN ID, Data ONTAP automatically assigns one. The default LUN ID begins with 0 and increments by 1 for each additional LUN that is created. If you have existing LUNs, Data ONTAP assigns the next available LUN ID. Example: <pre>lun map /vol/bootvol/bootlun1 boothost 0</pre>

Step	Action
3	Verify that the LUN is online and mapped to the igroup by entering the following command: <pre>lun show -v</pre> Example: <pre>netapp_1> lun show -v /vol/bootvol/bootlun1 18g (19327352832) (r/w,online, mapped) Serial#: OdCtSYv7Y6w3 Share: none Space Reservation: enabled Multiprotocol Type: hpux Maps: boothost=0</pre>

Discovering the new LUN as a host device

After you create the boot LUN and map it to the igroup, discover the LUN as a host device by completing the following steps:

Step	Action																																																								
1	On the host, enter the following command: <pre>ioscan -fn -C disk</pre> Example: In this example, the output from the command shows the following information: ◆ The LUN is visible to the host and ready to use because its state is CLAIMED ◆ There are no device entries for the NetApp LUN ◆ The storage appliance is in cfmode partner because there are four instances (paths) to the NetApp LUN you created. If your storage appliance is set to another cfmode supported by HP-UX (mixed or dual_fabric), then you might see a different number of paths to the boot LUN. <pre># ioscan -fn -C disk</pre> <table><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 colspan="7">=====</td></tr><tr><td>disk</td><td>0</td><td>0/0/1/1.15.0</td><td>sdisk</td><td>CLAIMED</td><td>DEVICE</td><td>HP 18.2GMAN3184MC</td></tr><tr><td></td><td></td><td></td><td>/dev/dsk/c1t15d0</td><td>/dev/rdsk/c1t15d0</td><td></td><td></td></tr><tr><td>disk</td><td>14</td><td>0/4/0/0.1.4.0.0.0.0</td><td>sdisk</td><td>CLAIMED</td><td>DEVICE</td><td>NETAPP LUN</td></tr><tr><td>disk</td><td>28</td><td>0/4/0/0.1.7.0.0.0.0</td><td>sdisk</td><td>CLAIMED</td><td>DEVICE</td><td>NETAPP LUN</td></tr><tr><td>disk</td><td>37</td><td>0/6/2/0.1.4.0.0.0.0</td><td>sdisk</td><td>CLAIMED</td><td>DEVICE</td><td>NETAPP LUN</td></tr><tr><td>disk</td><td>46</td><td>0/6/2/0.1.7.0.0.0.0</td><td>sdisk</td><td>CLAIMED</td><td>DEVICE</td><td>NETAPP LUN</td></tr></tbody></table>	Class	I	H/W Path	Driver	S/W State	H/W Type	Description	=====							disk	0	0/0/1/1.15.0	sdisk	CLAIMED	DEVICE	HP 18.2GMAN3184MC				/dev/dsk/c1t15d0	/dev/rdsk/c1t15d0			disk	14	0/4/0/0.1.4.0.0.0.0	sdisk	CLAIMED	DEVICE	NETAPP LUN	disk	28	0/4/0/0.1.7.0.0.0.0	sdisk	CLAIMED	DEVICE	NETAPP LUN	disk	37	0/6/2/0.1.4.0.0.0.0	sdisk	CLAIMED	DEVICE	NETAPP LUN	disk	46	0/6/2/0.1.7.0.0.0.0	sdisk	CLAIMED	DEVICE	NETAPP LUN
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disk	14	0/4/0/0.1.4.0.0.0.0	sdisk	CLAIMED	DEVICE	NETAPP LUN																																																			
disk	28	0/4/0/0.1.7.0.0.0.0	sdisk	CLAIMED	DEVICE	NETAPP LUN																																																			
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disk	46	0/6/2/0.1.7.0.0.0.0	sdisk	CLAIMED	DEVICE	NETAPP LUN																																																			
2	Enter the following command to install special files and create device entries on the host. <pre>ioinit -i</pre> If the <code>ioinit -i</code> command doesn't create device entries, use the <code>insf -e</code> command to install the device special files.																																																								
3	If...	Then...																																																							
	You want to migrate an existing system boot disk to the LUN by using MirrorDisk/UX	Proceed to “ Migrating an existing OS disk by using MirrorDisk/UX ” on page 11																																																							
	You want to install the OS from scratch by using an Ignite Server or an installation CD-ROM	Proceed to “ Installing the OS by using an Ignite Server or installation CD-ROM ” on page 18																																																							

Migrating an existing OS disk by using MirrorDisk/UX

Mirroring an existing system disk

If you created a new LUN for the boot device, and you want to migrate the existing system disk to the LUN, complete the following steps.

Step	Action																																																	
1	On the host, enter the <code>sanlun</code> command to determine which paths to the boot LUN are primary paths. The <code>sanlun</code> command is in the <code>/opt/NetApp/santools/bin</code> directory. For example, when the <code>cfmode</code> of the storage appliance is <code>partner</code> and the host has two HBAs, the <code>sanlun</code> command shows two primary paths to the filer. You use a primary path from one HBA to the filer LUN to create a physical volume and add it to the root volume group. <pre>sanlun lun show -p</pre> Note_____ When the <code>cfmode</code> of the storage appliance is <code>mixed</code> or <code>dual_fabric</code>, the <code>sanlun</code> command might show a different number of primary paths. You have to choose one primary path from a host HBA to the boot LUN. You add only a primary path to the root volume group. _____ Example: In this example, the device <code>c24t0d0</code> is a primary path you can use for the root volume group. This device is used throughout this procedure example as the boot LUN. <pre># sanlun lun show -p boothost:/vol/vol1/bootlun1 (LUN 0) VG: none 18g (19327352832) lun state: GOOD</pre> <pre>-----</pre> <table><tr><th>path</th><th>path</th><th>/dev/dsk</th><th>host</th><th>target</th><th>partner</th><th>PVlinks</th></tr><tr><th>state</th><th>type</th><th>filename</th><th>HBA</th><th>port</th><th>port</th><th>priority</th></tr><tr><td colspan="7">-----</td></tr><tr><td>up</td><td>secondary</td><td>/dev/dsk/c44t0d0</td><td>td1</td><td></td><td>5b</td><td></td></tr><tr><td>up</td><td>primary</td><td>/dev/dsk/c46t0d0</td><td>td1</td><td>5a</td><td></td><td></td></tr><tr><td>up</td><td>secondary</td><td>/dev/dsk/c26t0d0</td><td>td0</td><td></td><td>4b</td><td></td></tr><tr><td>up</td><td>primary</td><td>/dev/dsk/c24t0d0</td><td>td0</td><td>4a</td><td></td><td></td></tr></table> <pre>-----</pre>	path	path	/dev/dsk	host	target	partner	PVlinks	state	type	filename	HBA	port	port	priority	-----							up	secondary	/dev/dsk/c44t0d0	td1		5b		up	primary	/dev/dsk/c46t0d0	td1	5a			up	secondary	/dev/dsk/c26t0d0	td0		4b		up	primary	/dev/dsk/c24t0d0	td0	4a		
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up	primary	/dev/dsk/c24t0d0	td0	4a																																														

Step	Action
2	Create a bootable physical volume on the LUN by entering the following command: <pre>pvcreate -fB /dev/rdisk/ntap_device</pre> <i>ntap_device</i> is the raw disk device on the primary path to the LUN. Use the raw device node for the device you found in Step 1. -fB forces the creation of the physical volume and creates space for a boot area on the LUN. Example: <code>pvcreate -fB /dev/rdisk/c24t0d0</code>
3	Add the LUN to the root volume group (vg00). Use a block disk device node, not a raw disk device. <pre>vgextend vg00 /dev/dsk/ntap_device</pre> <i>ntap_device</i> is the disk device file for the primary path to the LUN. Use the device you found in Step 1. Example: <code>vgextend vg00 /dev/dsk/c24t0d0</code>
4	Add the remaining paths to the LUN to the root volume group by using NetApp's <code>ntap_config_paths</code> utility, which is in the <code>/opt/NetApp/santools/bin</code> directory. <pre>ntap_config_paths vg00</pre>
5	Enter the following command to copy boot utilities to the boot LUN. <pre>mkboot /dev/rdisk/ntap_device</pre> <i>ntap_device</i> is the device used for the boot LUN, for example, <code>c24t0d0</code>.
6	Enter the following commands to make sure that the host will boot if either the boot LUN or the system disk is unavailable. <pre>mkboot -a "hpux -lq" /dev/dsk/system_disk_device mkboot -a "hpux -lq" /dev/dsk/ntap_device</pre> <i>system_disk_device</i> is the path to the system disk device node, for example, <code>c1t15d0</code>. <i>ntap_device</i> is the device node on the primary path to the boot LUN, for example <code>c24t0d0</code>.

Step	Action
7	Enter the following command to display the logical volumes on the existing system boot disk (vg00). The logical volumes are displayed under the --- Logical volumes --- line in the command output. You mirror the logical volumes to the boot LUN. <pre>vgdisplay -v vg00</pre> Example: The following example is partial output from the vgdisplay command to show how two logical volumes are listed. <pre>--- Logical volumes --- LV Name /dev/vg00/lvol1 LV Status available/syncd LV Size (Mbytes) 300 Current LE 75 Allocated PE 75 Used PV 1 LV Name /dev/vg00/lvol2 LV Status available/syncd LV Size (Mbytes) 2048 Current LE 512 Allocated PE 512 Used PV 1</pre>

Step	Action
8	For each logical volume, use the <code>lvextend</code> command to mirror the logical volume from the existing system boot disk (vg00) to the boot LUN. <pre>lvextend -m 1 lv_path /dev/dsk/ntap_device</pre> <code>-m 1</code> specifies to mirror one logical volume. <i>lv_path</i> is the path to the logical volume, for example, <code>/dev/vg00/lvol2</code> <i>ntap_device</i> is the device on the primary path to the boot LUN, for example, <code>c24t0d0</code>. Example: This example mirrors logical volume 1 to the boot LUN (<code>/dev/dsk/c24t0d0</code>). <pre>lvextend -m 1 /dev/vg00/lvol1 /dev/dsk/c24t0d0</pre> The newly allocated mirrors are now being synchronized. This operation will take some time. Please wait Logical volume <code>"/dev/vg00/lvol1"</code> has been successfully extended. Volume Group configuration for <code>/dev/vg00</code> has been saved in <code>/etc/lvmconf/vg00.conf</code>
9	Update the Boot Device Reserved Area (BDRA) by entering the following command: <pre>lvlnboot -R</pre>
10	Using <code>vi</code> or another text editor, add a line to the <code>/stand/bootconf</code> file to identify the boot disk to the SDUX utility. Use the path to the block device node. <pre>1 /dev/dsk/ntap_device</pre> <i>ntap_device</i> is the device used for the boot LUN. Example: <code>1 /dev/dsk/c24t0d0</code>

Setting the host's boot paths

After you mirror the boot disk to the boot LUN, set the primary and alternate boot paths for the host by using the `setboot` command on the host. When you use the `setboot` command, you specify hardware paths to a device. This means that you have to identify the primary and secondary paths to the boot LUN by using the `sanlun` command, and then identify which hardware paths they correspond to by using the `ioscan` command.

To ensure system availability, the primary boot path must use a primary path to the boot LUN. The alternate boot path must use a secondary path to the boot LUN.

When you define the primary boot path, make sure you use the device that you identified in [Step 1](#) of “[Mirroring an existing system disk](#)” on page 11. This is the device you added to the root volume group and copied the HP-UX boot utilities to.

To set the host boot paths, complete the following steps.

Step	Action																																										
1	Display the paths to the boot LUN by entering the following command: <pre>sanlun lun show -p</pre> Example: In this example, the primary path to the boot LUN from host is /dev/dsk/c24t0d0. This is the device to which you mirrored logical volumes and copied HP-UX boot utilities in “Mirroring an existing system disk” on page 11. A secondary path to the boot LUN from the host is /dev/dsk/c44t0d0. These paths are used for the remainder of this procedure example. <pre># sanlun lun show -p boothost:/vol/vol1/bootlun (LUN 0) VG: /dev/vg00 18g (19327352832) lun state: GOOD</pre> <table><tr><td>path</td><td>path</td><td>/dev/dsk</td><td>host</td><td>target</td><td>partner</td><td>PVlinks</td></tr><tr><td>state</td><td>type</td><td>filename</td><td>HBA</td><td>port</td><td>port</td><td>priority</td></tr><tr><td>up</td><td>primary</td><td>/dev/dsk/c24t0d0</td><td>td0</td><td>4a</td><td></td><td>0</td></tr><tr><td>up</td><td>primary</td><td>/dev/dsk/c46t0d0</td><td>td1</td><td>5a</td><td></td><td>1</td></tr><tr><td>up</td><td>secondary</td><td>/dev/dsk/c44t0d0</td><td>td1</td><td></td><td>5b</td><td>2</td></tr><tr><td>up</td><td>secondary</td><td>/dev/dsk/c26t0d0</td><td>td0</td><td></td><td>4b</td><td>3</td></tr></table>	path	path	/dev/dsk	host	target	partner	PVlinks	state	type	filename	HBA	port	port	priority	up	primary	/dev/dsk/c24t0d0	td0	4a		0	up	primary	/dev/dsk/c46t0d0	td1	5a		1	up	secondary	/dev/dsk/c44t0d0	td1		5b	2	up	secondary	/dev/dsk/c26t0d0	td0		4b	3
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Step	Action																																																																																				
2	Enter the following command to determine which hardware paths correspond to the primary and secondary paths to the boot LUN, which you displayed in step 1. <pre>ioscan -funC disk</pre> Example: In this example, the hardware path for the primary path to the boot LUN is 0/4/0/0.1.4.0.0.0.0. Use this hardware path for the host’s primary boot path. The hardware path for the secondary path to the boot LUN is 0/6/2/0.1.7.0.0.0.0. Use this hardware path for the host’s alternate boot path. <pre># ioscan -funC disk</pre> <table><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><tr><td colspan="7">=====</td></tr><tr><td>disk</td><td>0</td><td>0/0/1/1.15.0</td><td>sdisk</td><td>CLAIMED</td><td>DEVICE</td><td>HP 18.2GMAN3184MC</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td>/dev/dsk/c1t15d0</td><td>/dev/rdsk/c1t15d0</td></tr><tr><td>disk</td><td>14</td><td>0/4/0/0.1.4.0.0.0.0</td><td>sdisk</td><td>CLAIMED</td><td>DEVICE</td><td>NETAPP LUN</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td>/dev/dsk/c24t0d0</td><td>/dev/rdsk/c24t0d0</td></tr><tr><td>disk</td><td>28</td><td>0/4/0/0.1.7.0.0.0.0.0</td><td>sdisk</td><td>CLAIMED</td><td>DEVICE</td><td>NETAPP LUN</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td>/dev/dsk/c26t0d0</td><td>/dev/rdsk/c26t0d0</td></tr><tr><td>disk</td><td>37</td><td>0/6/2/0.1.4.0.0.0.0.0</td><td>sdisk</td><td>CLAIMED</td><td>DEVICE</td><td>NETAPP LUN</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td>/dev/dsk/c46t0d0</td><td>/dev/rdsk/c46t0d0</td></tr><tr><td>disk</td><td>46</td><td>0/6/2/0.1.7.0.0.0.0.0</td><td>sdisk</td><td>CLAIMED</td><td>DEVICE</td><td>NETAPP LUN</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td>/dev/dsk/c44t0d0</td><td>/dev/rdsk/c44t0d0</td></tr></table>	Class	I	H/W Path	Driver	S/W State	H/W Type	Description	=====							disk	0	0/0/1/1.15.0	sdisk	CLAIMED	DEVICE	HP 18.2GMAN3184MC						/dev/dsk/c1t15d0	/dev/rdsk/c1t15d0	disk	14	0/4/0/0.1.4.0.0.0.0	sdisk	CLAIMED	DEVICE	NETAPP LUN						/dev/dsk/c24t0d0	/dev/rdsk/c24t0d0	disk	28	0/4/0/0.1.7.0.0.0.0.0	sdisk	CLAIMED	DEVICE	NETAPP LUN						/dev/dsk/c26t0d0	/dev/rdsk/c26t0d0	disk	37	0/6/2/0.1.4.0.0.0.0.0	sdisk	CLAIMED	DEVICE	NETAPP LUN						/dev/dsk/c46t0d0	/dev/rdsk/c46t0d0	disk	46	0/6/2/0.1.7.0.0.0.0.0	sdisk	CLAIMED	DEVICE	NETAPP LUN						/dev/dsk/c44t0d0	/dev/rdsk/c44t0d0
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3	Set the host’s primary boot path by entering the following command: <pre>setboot -p prim_hw_path_to_lun</pre> <i>prim_hw_path_to_lun</i> is the primary hardware path to the boot LUN from the host’s HBA1, which you displayed in step 2. Example: The following example shows how to set the primary boot path to the boot LUN by using the hardware path that corresponds to /dev/dsk/c24t0d0, the primary path. <pre>setboot -p 0/4/0/0.1.4.0.0.0.0</pre>																																																																																				

Step	Action	
4	Set the host's alternate boot path by entering the following command: <pre>setboot -a sec_hw_path_to_lun</pre> <i>sec_hw_path_to_lun</i> is the secondary hardware path to the boot LUN from the host's HBA2, which you displayed in step 2. Example: The following example shows how to set the alternate boot path to the boot LUN by using the hardware path that corresponds to /dev/dsk/c44t0d0, the secondary path. <pre>setboot -a 0/6/2/0.1.7.0.0.0.0</pre>	
5	Test the primary boot path by shutting down and rebooting the system. Note_____ If Autoboot is disabled (set to OFF) for your system, you will have to boot the system from the Boot Control Handler (BCH) menu. _____ <pre>shutdown -r -y 0</pre>	
6	If...	Then...
	You cannot reboot the system.	Proceed to “ Troubleshooting ” on page 23
	You can reboot the system	Proceed to “ Testing the alternate boot path ” on page 22.

Installing the OS by using an Ignite Server or installation CD-ROM

Identifying paths to the boot LUN

When you install the OS on the boot LUN, you need to specify a primary path to the boot LUN as the Root Disk. The installation process uses the `setboot` command to define the primary path to the boot LUN as the host's primary boot path. After the installation is complete, you manually enter the `setboot` command to define an alternate boot path. This means that you have to identify the primary and secondary paths to the boot LUN, and their corresponding hardware paths, before you begin the installation.

To identify the primary and secondary paths to the boot LUN, complete the following steps.

Step	Action																																																	
1	Display the primary and secondary paths to the boot LUN by entering the <code>sanlun</code> command, which is in the <code>/opt/NetApp/santools/bin</code> directory: <pre>sanlun lun show -p</pre> Example: In this example, a primary path to the boot LUN from the host is <code>/dev/dsk/c24t0d0</code>. A secondary path to the boot LUN from the host is <code>/dev/dsk/c44t0d0</code>. These paths are used as primary and secondary (alternate) paths for the remainder of this procedure example. <pre># sanlun lun show -p boothost:/vol/vol1/bootlun (LUN 0) VG: /dev/vg00 18g (19327352832) lun state: GOOD</pre> <pre>-----</pre> <table><tr><th>path</th><th>path</th><th>/dev/dsk</th><th>host</th><th>target</th><th>partner</th><th>PVlinks</th></tr><tr><th>state</th><th>type</th><th>filename</th><th>HBA</th><th>port</th><th>port</th><th>priority</th></tr><tr><th colspan="7">-----</th></tr><tr><td>up</td><td>primary</td><td>/dev/dsk/c24t0d0</td><td>td0</td><td>4a</td><td></td><td>0</td></tr><tr><td>up</td><td>primary</td><td>/dev/dsk/c46t0d0</td><td>td1</td><td>5a</td><td></td><td>1</td></tr><tr><td>up</td><td>secondary</td><td>/dev/dsk/c44t0d0</td><td>td1</td><td></td><td>5b</td><td>2</td></tr><tr><td>up</td><td>secondary</td><td>/dev/dsk/c26t0d0</td><td>td0</td><td></td><td>4b</td><td>3</td></tr></table>	path	path	/dev/dsk	host	target	partner	PVlinks	state	type	filename	HBA	port	port	priority	-----							up	primary	/dev/dsk/c24t0d0	td0	4a		0	up	primary	/dev/dsk/c46t0d0	td1	5a		1	up	secondary	/dev/dsk/c44t0d0	td1		5b	2	up	secondary	/dev/dsk/c26t0d0	td0		4b	3
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2	Enter the following command to determine which hardware paths correspond to the primary and secondary paths to the boot LUN, which you displayed in Step 1. <pre>ioscan -funC disk</pre> Example: In this example, the hardware path for the primary path to the boot LUN is 0/4/0/0.1.4.0.0.0.0. Use this hardware path for the host’s primary boot path. The hardware path for the secondary path to the boot LUN is 0/6/2/0.1.7.0.0.0.0. Use this hardware path for the host’s alternate boot path. <pre># ioscan -funC disk</pre> <table><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><tr><td colspan="7">=====</td></tr><tr><td>disk</td><td>0</td><td>0/0/1/1.15.0</td><td>sdisk</td><td>CLAIMED</td><td>DEVICE</td><td>HP 18.2GMAN3184MC</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td>/dev/dsk/c1t15d0</td><td>/dev/rdsk/c1t15d0</td></tr><tr><td>disk</td><td>14</td><td>0/4/0/0.1.4.0.0.0.0</td><td>sdisk</td><td>CLAIMED</td><td>DEVICE</td><td>NETAPP LUN</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td>/dev/dsk/c24t0d0</td><td>/dev/rdsk/c24t0d0</td></tr><tr><td>disk</td><td>28</td><td>0/4/0/0.1.7.0.0.0.0</td><td>sdisk</td><td>CLAIMED</td><td>DEVICE</td><td>NETAPP LUN</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td>/dev/dsk/c26t0d0</td><td>/dev/rdsk/c26t0d0</td></tr><tr><td>disk</td><td>37</td><td>0/6/2/0.1.4.0.0.0.0</td><td>sdisk</td><td>CLAIMED</td><td>DEVICE</td><td>NETAPP LUN</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td>/dev/dsk/c46t0d0</td><td>/dev/rdsk/c46t0d0</td></tr><tr><td>disk</td><td>46</td><td>0/6/2/0.1.7.0.0.0.0</td><td>sdisk</td><td>CLAIMED</td><td>DEVICE</td><td>NETAPP LUN</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td>/dev/dsk/c44t0d0</td><td>/dev/rdsk/c44t0d0</td></tr></table>	Class	I	H/W Path	Driver	S/W State	H/W Type	Description	=====							disk	0	0/0/1/1.15.0	sdisk	CLAIMED	DEVICE	HP 18.2GMAN3184MC						/dev/dsk/c1t15d0	/dev/rdsk/c1t15d0	disk	14	0/4/0/0.1.4.0.0.0.0	sdisk	CLAIMED	DEVICE	NETAPP LUN						/dev/dsk/c24t0d0	/dev/rdsk/c24t0d0	disk	28	0/4/0/0.1.7.0.0.0.0	sdisk	CLAIMED	DEVICE	NETAPP LUN						/dev/dsk/c26t0d0	/dev/rdsk/c26t0d0	disk	37	0/6/2/0.1.4.0.0.0.0	sdisk	CLAIMED	DEVICE	NETAPP LUN						/dev/dsk/c46t0d0	/dev/rdsk/c46t0d0	disk	46	0/6/2/0.1.7.0.0.0.0	sdisk	CLAIMED	DEVICE	NETAPP LUN						/dev/dsk/c44t0d0	/dev/rdsk/c44t0d0
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3	Record the primary and secondary hardware and device paths. During installation, you use a primary path to the LUN to define the root disk (vg00). After you install the OS, you use a secondary path to define the host’s alternate boot path.																																																																																				

Installing the OS on the boot LUN To install the OS on the boot LUN, complete the following steps.

1	If...	Then...
	You are installing from a CD	Follow the HP instructions to boot from the CD.
	You are installing from an Ignite Server	1. Shutdown the host by entering the following command: <pre>shutdown -r -y 0</pre> Note _____ If Autoboot is enabled (set to ON), you have to interrupt the boot process to get to the Boot Control Handler (BCH) menu. If Autoboot is disabled (set to OFF), the system comes up and displays the BCH menu. 2. When the system is back up, enter the following command at the BCH Main Menu prompt: <pre>bo lan.<server_IP></pre> <i>server_IP</i> is the IP address of the Ignite Server. Example: <pre>Main Menu: Enter command or menu > bo lan.10.105.36.44 Interact with IPL (Y, N, or Cancel)?> n</pre>
2	In the HP-UX installation, configure system parameters, such as network services, file-system characteristics, and other configuration details. Make sure that you define the Root Disk as the primary path to the boot LUN. This is the path you obtained in Step 1 of “Identifying paths to the boot LUN” on page 18. In the Ignite-UX Interface, you define the Root Disk in the Basic tab. When you define the primary path to the boot LUN as the Root Disk, the installation script does the following: ◆ Configures the root volume group (vg00) and adds remaining path to the LUN to the root volume group. ◆ Uses the <code>setboot -p</code> command to define the primary path to the boot LUN as the host’s primary boot path. Note _____ For details about configuring other system parameters, consult the HP documentation for your OS.	

3	After you complete the HP-UX installation, install the NetApp SAN Host Attach Kit 1.0 for Fibre Channel on HP-UX software on the boot LUN. For detailed installation instructions, see the <i>Installation and Setup Guide</i> for the SAN Host Attach Kit 1.0.	
4	Add the remaining paths to the LUN to the root volume group by using NetApp's <code>ntap_config_paths</code> command, which is in the <code>/optNetApp/santools/bin</code> directory. <code>ntap_config_paths vg00</code>	
5	Set the host's alternate boot path by entering the following command: <code>setboot -a sec_hw_path_to_lun</code> <code>sec_hw_path_to_lun</code> is the secondary hardware path to the boot LUN from the host, which you obtained in Step 2 of “ Identifying paths to the boot LUN ” on page 18. Example: <code>setboot -a 0/6/2/0.1.7.0.0.0.0</code>	
6	Test the primary boot path by shutting down and rebooting the system. Note _____ If Autoboot is disabled (set to OFF) for your system, you will have to boot the system manually. _____ <code>shutdown -r -y 0</code>	
7	If...	Then...
	You cannot reboot the system.	Proceed to “ Troubleshooting ” on page 23
	You can reboot the system	Proceed to “ Testing the alternate boot path ” on page 22.

Testing the alternate boot path

Testing the alternate boot path

NetApp recommends that you test the alternate boot path before you put a SAN-booted configuration into a production environment. To test the alternate boot path, complete the following steps.

Step	Action
1	Shutdown the host by entering the following command: <code>shutdown -r -y 0</code>
2	At the Main Menu prompt of the Boot Console Handler (BCH), boot from the alternate boot path by entering the following command: <code>bo alt</code>
3	Shutdown the host again: <code>shutdown -r -y 0</code>
4	At the Main Menu prompt of Boot Console Handler (BCH), boot from the alternate boot path by entering the following command: <code>bo pri</code>

Configuring SAN booting

Troubleshooting

If you cannot boot from the primary or alternate path

If the system does not boot from the primary or alternate path, check the following configuration components:

- ◆ Connectivity—Check physical connectivity and cabling between the HBA, the switches, and the filer cluster.
- ◆ Boot path settings—If your system fails to boot from either the primary or alternate path, boot from the internal system disk, and then check your boot path settings.

Checking boot path settings: To boot from the system disk and check your boot path settings, complete the following steps:

Step	Action
1	If the system does not return to the Boot Control Handler (BCH) menu, reset the system to return to the BCH prompt.
2	Boot from the internal system disk by entering the following command: <pre>bo path</pre> <i>path</i> is the hardware path to the internal disk that the system formerly booted from. Example: The following example uses the hardware path to the internal system disk. <pre>bo 0/0/1/1.15.0</pre>
3	Verify that you correctly translated the primary and secondary device paths to the boot LUN to the correct hardware paths by using the following commands: ◆ <code>sanlun lun show -p</code>—Shows the primary and secondary device paths to the boot LUN. ◆ <code>ioscan -funC disk</code>—Shows the hardware paths to the device files.

Step	Action
4	Make sure that all paths to the boot LUN are in the root volume group by entering the following command: <pre>vgdisplay -v vg00</pre> Result: Paths to the LUN are listed under the <code>Physical volumes</code> section of the output. Example: In the following example, all paths to the boot LUN are in the root volume group. <pre>--- Physical volumes --- PV Name /dev/dsk/c24t0d0 PV Name /dev/dsk/c26t0d0 Alternate Link PV Name /dev/dsk/c46t0d0 Alternate Link PV Name /dev/dsk/c44t0d0 Alternate Link PV Status available Total PE 4606 Free PE 1577 Autoswitch On</pre>
5	If all paths to the boot LUN are not in the root volume group, add the remaining paths by using the <code>ntap_config_paths</code> utility, which is in the <code>/opt/NetApp/santools/bin</code> directory. <pre>ntap_config_paths vg00</pre>