HP-UX boot over SAN

White paper

Table of contents

Document overview

This white paper is intended to help you determine whether booting your HP-UX server from a Storage Area Network (SAN) connected device is appropriate for your particular computing environment. In addition, it offers recommendations for implementing and configuring your HP-UX server and HP StorageWorks storage array to boot over SAN.

Intended audience

This document is intended for customers who are familiar with:

- HP-UX boot device configuration
- HP Fibre Channel Host Bus Adapters (HBAs) for HP-UX servers
- HP StorageWorks Storage arrays
- HP StorageWorks SAN switches

Introduction

Traditionally, HP-UX servers were configured to boot from internal parallel SCSI storage devices. This was often done for convenience because early SCSI busses had short cable distances available. In some cases, the boot devices were external and connected to an add-on parallel SCSI bus. Implementing boot from an external disk device improved the availability of servers needing repair by enabling a replacement server to be connected and booted from the original server's boot device. However, the distance limitations of parallel SCSI busses highlighted the need for a different I/O transport. One that provided greater cable distance and flexibility to allow connect and disconnect of links while the I/O adapters were powered on.

In 1997, HP-UX servers began supporting Fibre Channel (FC) HBAs that had the ability to boot from HP Fibre Channel/SAN connected online storage devices. This breakthrough by HP meant that boot devices were no longer limited to the short cabling distances available with parallel SCSI busses. Fibre Channel I/O adapters also provided additional availability and scalability features that enabled true server and storage consolidation initiatives to be realized. Fibre Channel SAN has proven to be the only practical way to construct a large shared-data cluster configuration.

Why consider booting HP-UX from a SAN connected device?

Following are some of the key decision points and advantages to consider when evaluating whether an external, SAN attached boot device is appropriate for your computing environment:

Redundant storage paths – Internal disk devices in the server do not have redundant I/O paths to provide for path failover if one path fails.

Server consolidation – When using nPartitions or vPartitions (hard or soft server partitions), you must have a separate boot device for each partition. With vPartitions (vPars), only one of the soft partitions can use the available internal disks (internally connected storage) in that server or nPartition (nPar) as a boot device.

Storage consolidation – Many large data centers reduce operating costs by consolidating the online storage, including boot LUNs, in the data center into a few high-end, high-capacity storage subsystems, such as the HP StorageWorks XP and EVA arrays. Centralization allows monitoring and maintenance to be focused on a few arrays instead of being dispersed over many small arrays or disk mechanisms throughout the data center. Further cost reduction is achieved by not purchasing internal disk storage as boot devices when purchasing servers.

Rapid infrastructure changes – Fibre Channel cables, unlike parallel SCSI cables, can be connected and disconnected without requiring the server or HBA to be powered off. Additionally, Fibre Channel SANs can be easily and dynamically zoned to establish logical groups (zones) across the physically connected devices in the SAN infrastructure.

Disaster recovery – Certain HP StorageWorks arrays can be configured using the Continuous Access (CA) functionality to create and maintain a remote mirror copy of the boot LUN to enable low cost disaster recovery at a remote site. This remote mirror copy of the boot LUN can then be connected to and booted from an alternate server available at the remote site.

Minimized server maintenance downtime – Separating the boot device from the server can decrease server downtime required to perform maintenance of the internal disk devices (scheduled maintenance, firmware updates, and so on). Many of today's high-end SAN attached disk arrays, such as HP StorageWorks XP and EVA disk array products, provide online firmware updates, which further decrease server uptime disruptions for boot disk maintenance.

Increased distance between server and storage – In large data centers with tens and even hundreds of servers, having the server and connected mass storage close enough to each other to be able to meet the connection distance limitations of parallel SCSI is not always possible. SAN connected storage provides the distance and cabling flexibility needed for these environments. SAN connected storage also plays a major role in the high-availability configurations available today, such as the HP Extended Serviceguard Cluster, which allows connection distances up to 100 kilometers between servers and storage.

Limited I/O ports in a server or partition – Some business environments or applications are implemented using many small servers, blade servers, or small virtual partitions. These small servers and partitions often have only a few I/O ports available for connections of mass storage and networking, so using an I/O transport like Fibre Channel, which can provide up to 1536 LUNs per I/O port, is important.

Improved availability – Today's SAN attached storage arrays provide much greater availability than was capable with single path parallel SCSI disk devices. Today's storage arrays, such as the HP StorageWorks disk array products, provide striping, mirroring, and access redundancy features.

State-of-the-art technology – Use of Fibre Channel SANs enables access to today's leading mass storage technologies, including advanced disk subsystems and tape libraries.

Supported configurations

This section describes the hardware configurations that support booting HP-UX from a SAN connected boot device.

Supported HP-UX servers

All HP-UX servers support boot from a SAN connected device with supported HP StorageWorks storage arrays and SAN switches. Refer to the following sections for further details on supported HP host bus adapters (HBAs), HP StorageWorks products, and other possible alternatives.

The HP-UX operating system requires a unique, dedicated disk or LUN for booting and running the operating system. You can segment this disk or LUN using the HP Logical Volume Manager (LVM) or for some specific configurations, Symantec VxVM, both of which are available with HP-UX. Please contact your HP or Symantec Representative for further details.

You can also allocate swap and dump space on the root disk or LUN; however, for systems with large memory space, you should consider providing additional swap and dump space by using additional disk LUNs. For further information on installing HP-UX on a boot LUN, refer to the appropriate HP-UX Installation Guide, available at http://docs.hp.com .

SAN boot is also supported with vPars (soft partitions) on those HP-UX servers that support vPars. Refer to the Installing and Managing Virtual Partitions (vPars) manual for further guidelines.

Supported HP Host Bus Adapters (HBAs)

The following table shows the HP host bus adapters HBAs that are supported for boot from SAN for each HP-UX server family.

HP-UX server model (family)	Supported HBAs to boot from SAN				
HP 9000 servers	A6795A (1 port 2Gb)	A6826A (2 port 2Gb)	A9782A, A9784A (2Gb combo)	AB465A (2Gb combo)	AB378A (1 port 4Gb)
rp24xx	•	•			
rp34x0	•	•	•	•	
rp44xx	•	•	•	•	
rp54xx	•	•			
rp7410	•	•	•		
rp7420	•	•	•	•	•
rp8400	•	•	•		
rp8420	•	•	•	•	•
Superdome (PA 8600, PA8700)	•	•	•		
Superdome (PA 8800 and later)	•	•	•	•	•
HP Integrity Servers					
rx16xx	•	•	•	•	
rx26xx	•	•	•	•	
rx46xx	•	•	•	•	
rx56xx	•	•	•		
rx76xx	•	•	•	•	•
rx86xx	•	•	•	•	•
Integrity Superdome	•	•	•	•	•

Refer to the HBA user documentation for the system firmware version required to support boot for the appropriate model of server and version of HP-UX. You can obtain Installation Guides and Release Notes by searching for the HBA product number (for example, A6826A) at the HP Technical Documentation Web site at:

http://docs.hp.com

For HBAs with multiple FC ports, such as the A6826A and AB465A adapters, each port appears to the system and in an ioscan display as a standalone adapter.

There are no specific boot LUN limitations regarding the number of disk devices or LUNs that can be connected to an HBA on a server other than the general maximum LUN guidelines. Refer to the Maximum LUN Configuration and Considerations for HP-UX white paper for more details:
http://www.docs.hp.com/en/7154/Max_LUN_whitepaper_v11.23.pdf

HP HBAs are set for Auto Speed Negotiation (ASN) so that they can automatically connect at the fastest I/O speed supported by the connecting component.

NOTE: HP HBAs support boot in Direct Fabric Attach (DFA, a.k.a. switched fabric) and Private/Public Loop modes. However, not all storage devices support these FC connection modes. Refer to the specific configuration guidelines and limitations for your storage array.

Supported HP StorageWorks SAN switches

HP StorageWorks SAN B-Series, C-Series, and M-Series switch products support booting from the SAN.

Refer to the HP StorageWorks SAN Design Reference Guide for the current list of supported switch models for these product lines. This guide is available at:
http://h18006.www1.hp.com/products/storageworks/san/documentation.html

Supported SAN attached StorageWorks storage array systems

The supported storage arrays for HP-UX boot from SAN include:

- HP StorageWorks XP Disk Arrays
- HP StorageWorks Enterprise Virtual Arrays (EVA)
- HP StorageWorks Modular Smart Array 1000 and 1500 (MSA1000 & MSA1500)
- HP StorageWorks Virtual Arrays (VA)

Refer to the user reference guide for your selected HP StorageWorks array for further information and guidelines regarding configuration and use of the array as a HP-UX SAN boot device.

Third-party storage devices

The EMC Symmetrix and DMX storage arrays are supported for HP-UX boot from SAN.

Some other third-party storage devices have passed interoperability validation for HP-UX boot from SAN. You can find additional information on these interoperable third-party storage devices at:
http://www.hp.com/products1/serverconnectivity/mass_storage_devices.html

SAN boot device general guidelines

This section summarizes general recommendations for configuring a SAN boot device in your computing environment. Refer to the user reference guide for your selected storage device for further information and guidelines regarding device specific configuration recommendations and use as a HP-UX SAN boot device.

SAN Boot Device Configuration Recommendations

Specific SAN boot device configuration recommendations and limitations are unique to each storage device. The following are offered as recommended subjects to review for your selected storage device.

Protection group or disk group recommendations

Protection groups or disk groups are groupings of physical disk mechanisms into a storage pool in which virtual LUNs are created and the data is striped across with designated RAID protection. Refer to the documentation for your storage device for the recommended size (number of LUNs) that should be in a protection group or disk group that has a boot LUN. Following are some general guidelines to consider:

- Do not configure a boot LUN in a protection group or disk group that contains only a few disks and also has high application data activity
- For arrays that are not capable of creating protection groups or disk groups with a large number of disks included, create a protection group or disk group for boot LUNs that is separate from protection groups or disk groups that contain heavily used application data.

RAID level recommendations

Both RAID Level 1 and Level 5 are frequently used for boot LUNs with satisfactory results. If your storage array provides hardware-assisted RAID protection, it is recommended to use the hardware RAID protection available with the array and not use the software RAID utilities available with volume managers. Using a software RAID utility takes processor cycles away from applications and can be quite excessive if there is a lot of data movement to the associated LUNs.

Array port loading recommendations

Refer to the documentation for your selected SAN storage array for specific guidelines on controller port loading recommendations, such as:

- Maximum number of LUNs per controller port
- Maximum number of boot LUNs per controller port
- Sharing disk spindles that have a boot LUN

It is highly recommended that you do not configure boot LUNs to be on array controllers which have continuous high application data activity.

High availability cluster boot device recommendations

If the server is part of a Serviceguard high-availability cluster, it is highly recommended that you configure the boot LUN to have a software mirrored copy using MirrorDisk/UX for additional availability.

Also, when using internal boot LUNs within a Serviceguard high-availability cluster, it is highly recommended that you use software mirroring to create a mirror copy of the boot LUN in an external disk enclosure or disk array for higher availability.

For additional information, refer to the section titled “Creating Mirrors of Root Logical Volumes” in the Managing Serviceguard Version A.11.16, Eleventh Edition reference guide, available at:

http://docs.hp.com

Additional recommendations

HBA replacement

If you use some form of LUN security within the SAN and you replace an FC HBA in the server, you might need to reconfigure your LUN security mechanism to allow access of appropriate LUNs to this new HBA. Most LUN security mechanisms use the host HBA World Wide Port Name (WWPN or pWWN) and World Wide Node Name (WWNN or nWWN) to determine which HBA can access which LUNs in the storage array. When you change or replace a host HBA, the WWPN and WWNN of the new HBA will be different and so LUNs will not be visible to this new HBA until the LUN security is changed. It is recommended to remove the WWPN and WWN of the HBA being removed from the LUN security mechanism so that if it is reused, you do not have access to previously configured LUNs.

Server replacement

If you replace a failed server, it is often advisable to retain all the FC HBAs from the server being removed and install them in the replacement server. Using the old HBAs, and their assigned WWPN and WWN, in the replacement server can save valuable time because you eliminate the need to reconfigure your LUN security mechanism and SAN zoning to remove old HBAs and add new HBAs to all the existing LUNs. Additionally, it is further recommended that you try to install the HBA that was configured for SAN boot in the same I/O slot of the replacement server.

Additional information

For more information, consult the following resources:

HP-UX servers – http://welcome.hp.com/country/us/en/prodserv/servers.html
Fibre Channel HBAs – http://www.hp.com/products1/serverconnectivity/index.html
Fibre Channel switches – http://h18006.www1.hp.com/storage/saninfrastructure.html
HP StorageWorks array systems – http://h18006.www1.hp.com/storage/arraysystems.html

HP StorageWorks SAN Design Reference Guide -
http://h18006.www1.hp.com/products/storageworks/san/documentation.html

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