Network storage management with HP StorageWorks iSCSI Feature Pack and HP StorageWorks storage servers — white paper

Introduction

The emergence of the Internet SCSCI (iSCSI) standard and the broad industry support that it is garnering translate into lower-cost network storage solutions as compared to Fibre Channel architectures. By integrating iSCSI management solutions into the Microsoft® Storage Server 2003 operating system, HP is delivering increased flexibility to IT management while providing a cost-effective network attached storage (NAS) solution for small and medium businesses. This establishes an industry first, combining iSCSI management into the Web user interface and delivering an easy-to-use framework for combined file and (iSCSI) block management.

iSCSI: an overview

Deploying a network storage infrastructure for **consolidating** block-oriented storage has traditionally relied on the use of Fibre Channel (FC) technologies. The FC storage architecture is regarded as a fault-tolerant, high-performance medium for mission-critical applications such as databases and messaging servers. However, the higher cost and complexity of deploying FC storage has largely limited the adoption of this technology to the data centers of large enterprises.

Moreover, given its complexity, FC is an architecture medium that requires its own dedicated infrastructure and IT personnel for deployment, management, and troubleshooting. Existing administrators, who know Ethernet inside and out, are not usually sufficiently versed in FC to manage an FC network.

In February 2003, the Internet Engineering Task Force (IETF) ratified the iSCSI protocol standard. This protocol is used to encapsulate SCSI commands in TCP/IP to deliver storage over a traditional Fast Ethernet or Gigabit Ethernet network. As with any SCSI connection, there is an initiator and a storage target (Figure 1). The iSCSI protocol makes it possible for the initiator or host to connect to the storage target anywhere on an Internet Protocol (IP) network, whether through a local area network (LAN) or wide area network (WAN) connection.

Figure 1.
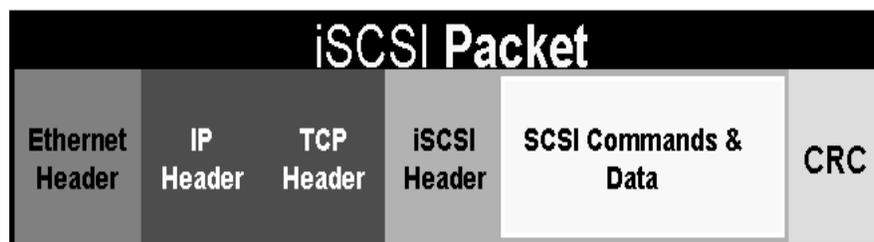
Companies that have not had the resources or expertise to deploy a Fibre Channel architecture can now deploy a network storage solution that not only uses the commonly known Ethernet-based infrastructure, but also can leverage an **existing** Ethernet infrastructure. This solution enables companies to realize better storage utilization, simplified management, and resulting cost savings that can be achieved from consolidating and centralizing storage management on FC, while avoiding the inherent complexity of FC and high costs of deployment and operation.

There is broad industry support for the iSCSI protocol. Microsoft has made available a software iSCSI initiator for the Microsoft Windows® 2000, Windows XP, and Windows 2003 Server platforms. This software can be downloaded from the Microsoft site and allows client or server systems to have support for connection to an iSCSI target. HP-UX, Novell, and Red Hat have also released software initiators for their respective operating systems.

In addition to software initiators, several manufacturers have released hardware initiators, also referred to as iSCSI host bus adapters (HBAs). These adapters, which are seen as SCSI devices by the operating system, offload TCP/IP protocol handling from the computer or server CPU. Whereas with software initiators, iSCSI traffic and traditional TCP/IP traffic is carried through the same interface, an iSCSI HBA separates the iSCSI traffic from the regular network traffic (Figure 2).

Figure 2.
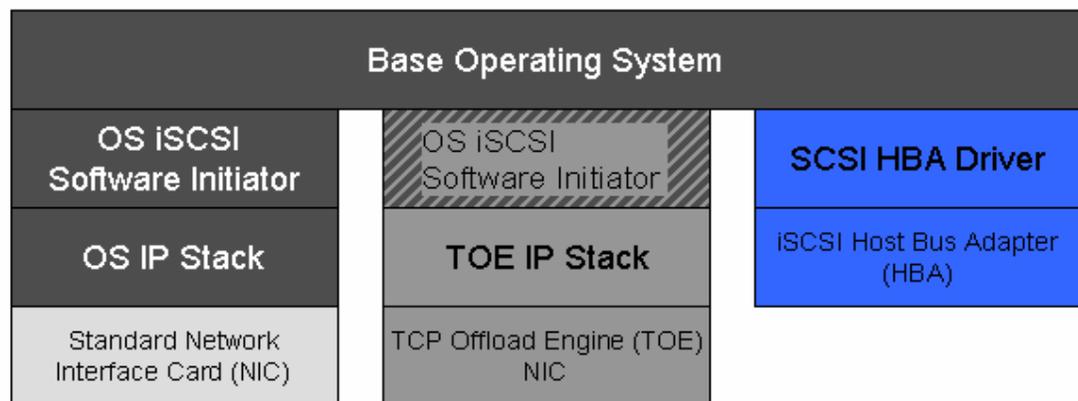
Depending on the CPU usage of a system, there might not be enough overhead to support a software iSCSI initiator. By handling the TCP/IP transactions, the iSCSI HBA frees a CPU for running applications. Another method of improving CPU utilization is to offload only the TCP/IP transactions. This solution is delivered by way of adapters called TCP/IP Offload Engines (TOEs). In addition, some companies have developed iSCSI accelerators that improve CPU utilization by offloading only the iSCSI transactions.

The Windows Hardware Compatibility Labs (WHQL) group at Microsoft maintains a Windows Hardware Compatibility List (WHCL) for third-party initiators and targets to ensure interoperability and quality computer hardware, both systems and peripherals, for Windows. The HP StorageWorks iSCSI Feature Pack and HP StorageWorks NAS platforms are certified and listed with the Microsoft WHQL.

There are several emerging options for the iSCSI storage target:

• iSCSI/FC bridge or gateway
• Dedicated iSCSI array
• Multiprotocol storage server, which adds iSCSI on top of a NAS platform

iSCSI/FC bridge or gateway

The iSCSI/FC bridge is an appealing solution for companies that have an existing FC storage area network (SAN) and are looking to connect "stranded" servers (servers not directly attached to the data center) to the central storage pool. The bridge enables administrators to use existing management tools to carve out a virtual disk from the existing, available SAN resources and associate this virtual disk over Ethernet to a server or client system beyond the data center (Figure 3).

Figure 3.
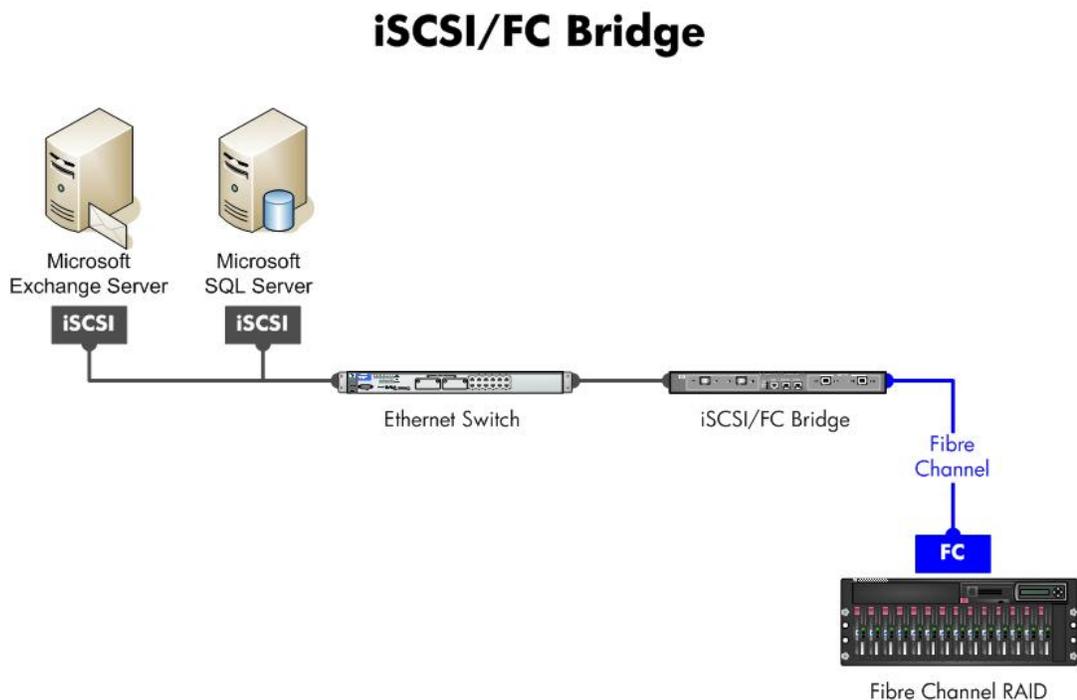
Dedicated iSCSI array

An iSCSI array is a dedicated block storage device, which is deployed in the same manner as FC arrays and can include proprietary management software. Solutions on the market today are just beginning to emerge. Some FC array vendors are providing iSCSI support so users can use the same management tools for data center deployments that are employed in branch offices (Figure 4).

Figure 4.

Before: SAN Configuration with separate iSCSI block array and NAS
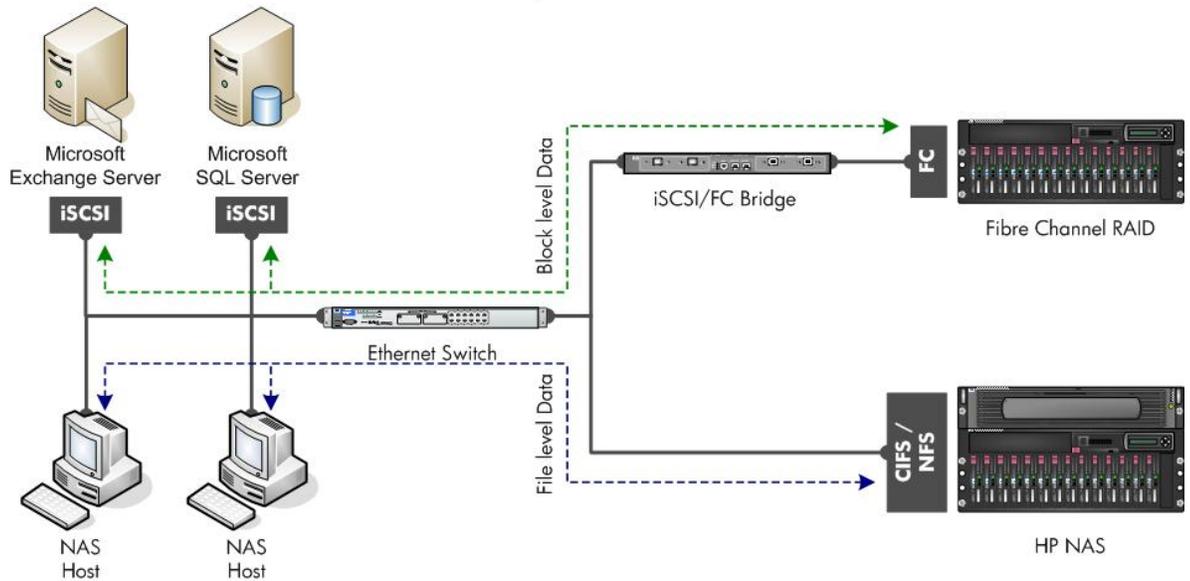
Multiprotocol storage server

The final iSCSI target configuration involves adding HP StorageWorks iSCSI Feature Pack to an HP StorageWorks NAS platform, evolving the system from a file service-focused solution to a file **and/or** block storage server. Because the NAS is already connected to an Ethernet network, adding iSCSI target functionality is a convenient way of enhancing the flexibility and scaling the storage resources. With this solution, users have the flexibility to able to create file shares and block virtual disks from the same platform (Figure 5).

Figure 5.

After: Windows Storage Server 2003 with HP iSCSI Feature Pack serves both block and file data to network Systems

Microsoft Exchange Server

Microsoft SQL Server

iSCSI

iSCSI

Block level Data

iSCSI

Ethernet Switch

CIFS / NFS

File level Data

NAS Host

NAS Host

HP NAS with HP iSCSI Feature Pack
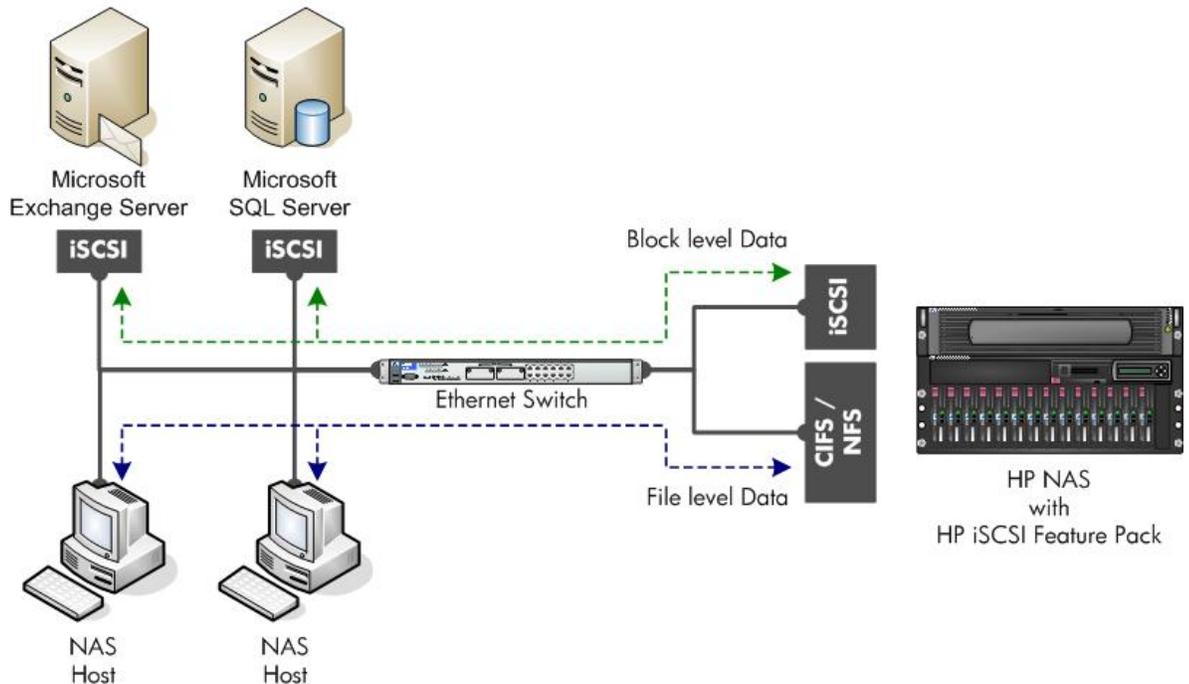
HP StorageWorks iSCSI Feature Pack delivers a suite of essential storage services for storage servers

Since the launch of the first Microsoft Windows-powered NAS platform in 2001, Microsoft-based NAS sales have grown to capture 41% market share. This growth is primarily caused by the value and interoperability provided by a standards-based platform. HP StorageWorks iSCSI Feature Pack software and its suite of core storage management services are delivering additional flexibility to the already strong value of file service features available through Microsoft Windows Storage Server 2003.

HP StorageWorks iSCSI Feature Pack software is comprised of a Windows-compatible iSCSI target driver and Internet Storage Name Service (iSNS). For ease of use, the software management has been integrated under a tabular iSCSI management window in the HP StorageWorks NAS Web-based administration screen (Figure 6).

Figure 6. iSCSI Feature Pack Web administration page
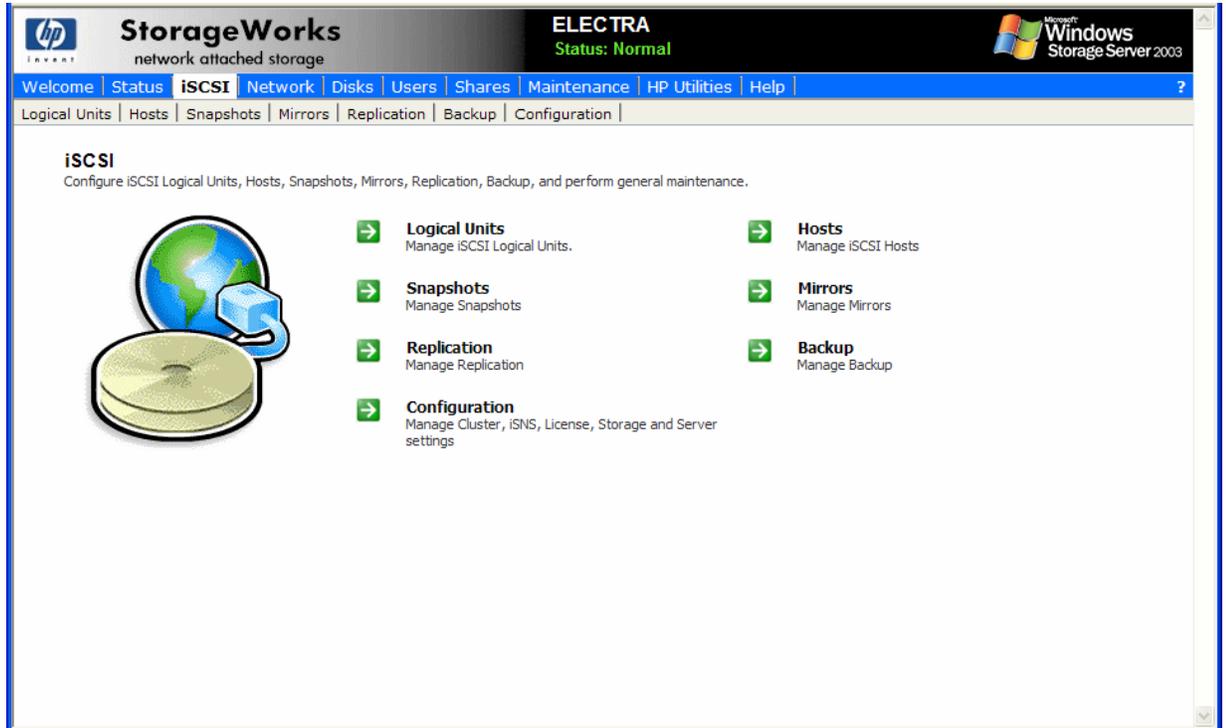
Because of the demanding performance, low-latency, and error-free requirements of block level storage, the I/O handling "core" of HP StorageWorks iSCSI Feature Pack software resides in the Windows Storage Server 2003 kernel, and the data path has been streamlined for speed and ease of failover without data corruption. The bulk of CPU cycles consumed by an iSCSI storage server are related to the processing of I/Os through the TCP/IP protocol stack (Figure 7).

Figure 7.
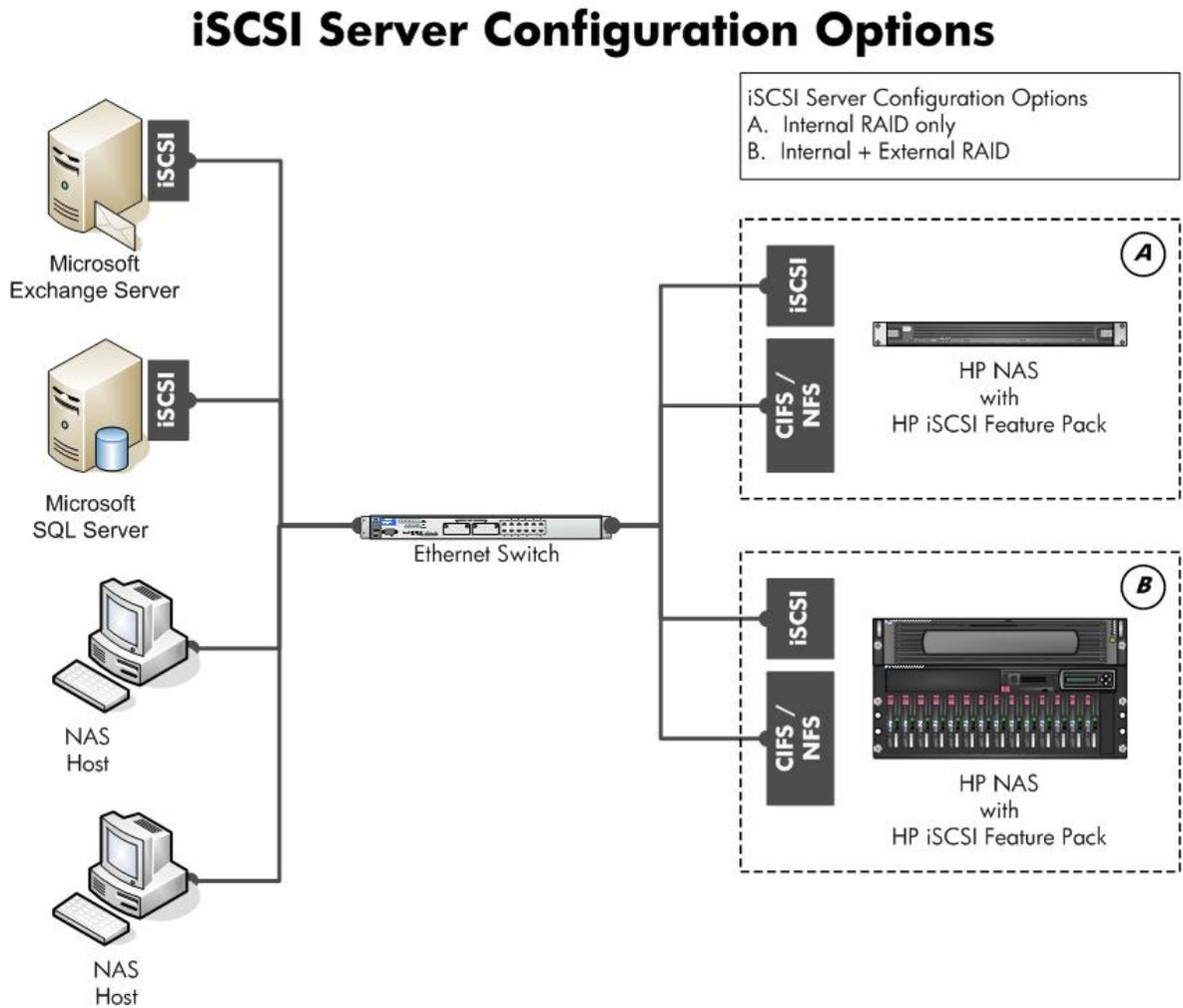
Provisioning, configuring, and assigning iSCSI logical units

When HP StorageWorks iSCSI Feature Pack software has been installed, an iSCSI tab will appear on the HP StorageWorks NAS Web-based administration console. All features related to the HP StorageWorks iSCSI Feature Pack server appear under this tab. The first step an administrator must perform concerns the creation of storage that is set aside for iSCSI virtual disks (also known as logical units [LUs]). Several methods can be used for this task. The administrator can create logical disks or file devices for this purpose. For easy storage expansion, the administrator can create pools of storage from logical disks or file devices. Figure 8 illustrates the creation of pools of storage that are set aside for iSCSI LUs. Disk storage outside of the pools can be allocated to standard NAS shared folders and remain under the management of the Microsoft Disk Management tool.

Figure 8. HP StorageWorks iSCSI Feature Pack storage pools

On HP StorageWorks NAS devices where there are no raw disks available, the storage administrator may opt to reserve space on the NT file system (NTFS) volumes where shared folders are kept.

In Figure 9, the pool of storage is treated as a "file" and, as such, goes through another system layer. This configuration can impact performance, but for small enterprises, this modest performance trade-off is balanced by the greatly simplified storage management.

Figure 9.

Ways to create iSCSI Feature Pack Storage Pools
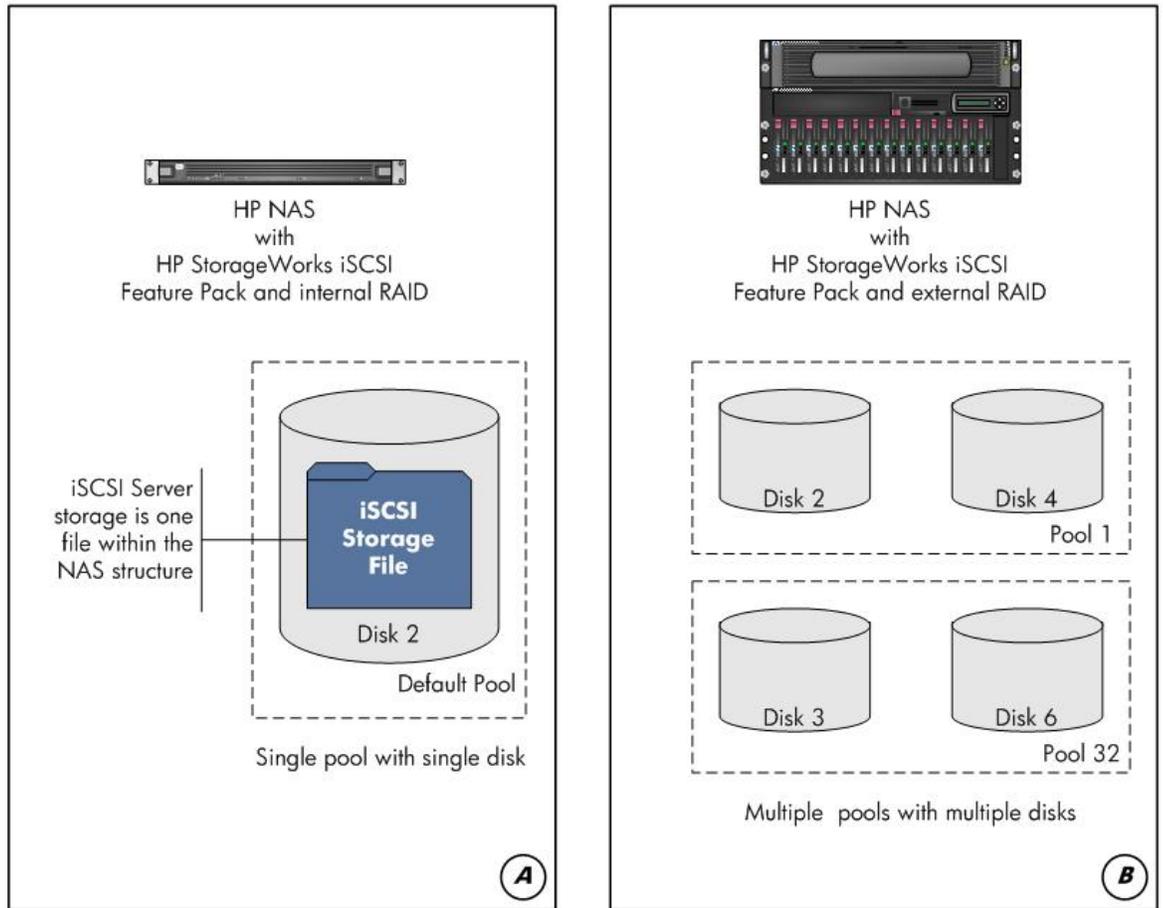
After the pool is created, a wizard guides the administrator through creation of the iSCSI LUs. LUs can be created or expanded by using storage from the unallocated area of the iSCSI storage pool (see Figure 10).

Figure 10. Creating an iSCSI Logical Unit Web administration pages
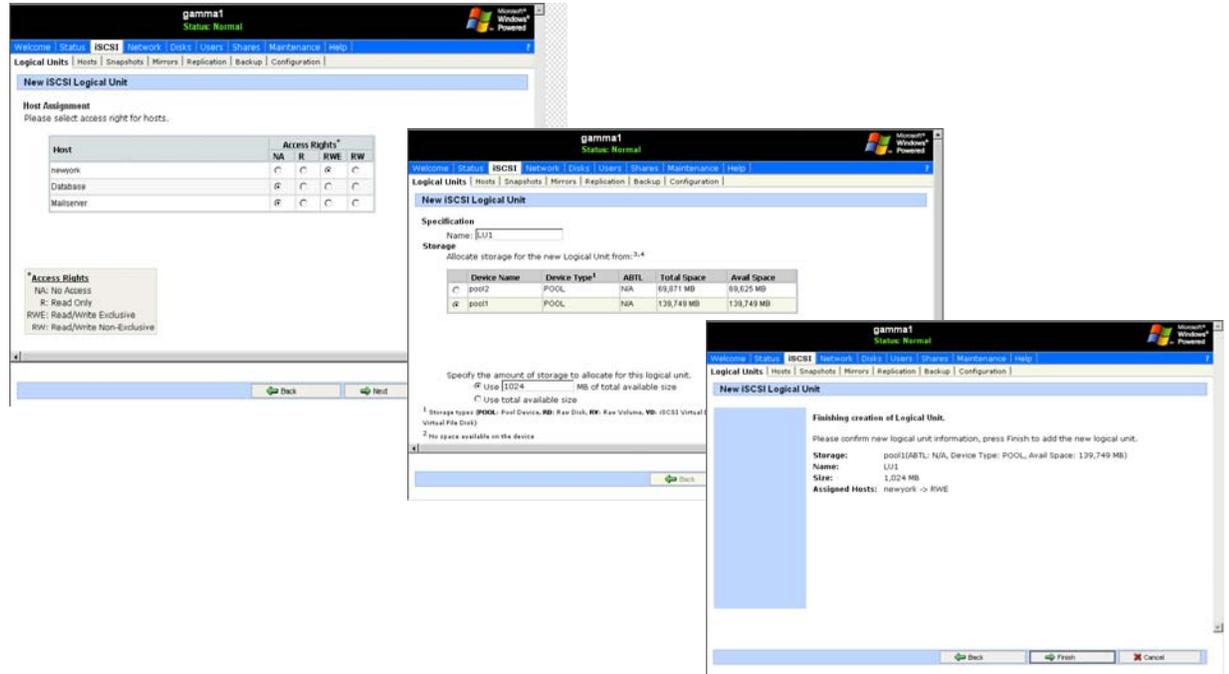
The administrator's final step is to assign a particular iSCSI LU to hosts and set the access rights (for example, read-only, read-write exclusive, and read-write non-exclusive). Multiple hosts with read-write rights that are accessing the same iSCSI LU should be part of a clustering environment. Hosts can be authenticated using Challenge Handshake Authentication Protocol (CHAP). In addition, a built-in iSNS server service can be activated in the event an external Microsoft-provided iSNS server is not available (see Figure 11).

Summary

The HP StorageWorks iSCSI Feature Pack for HP StorageWorks NAS devices provides a rich set of administrator tools for providing block storage services that deliver a wide range of benefits demanded by today's IT management, including consolidated storage and provisioning over iSCSI for reduced total cost of ownership and continuous data availability and instant data recovery to ensure business continuity.

The combination of a familiar, easy-to-use Web-based HP StorageWorks NAS administrative user interface with the simplicity of implementing and utilizing the HP StorageWorks iSCSI Feature Pack and suite of storage services delivers, for the first time, a highly practical and cost-effective way for systems administrators to consolidate block and file-sharing storage. This solution is an extremely attractive offering for small- and medium-sized businesses. While these businesses might be unequipped to move to a Fibre Channel network, they now have the opportunity to efficiently and cost-effectively manage their growing storage needs while leveraging their existing Ethernet IT infrastructure and know-how.

For more information

http://www.hp.com/go/nas

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