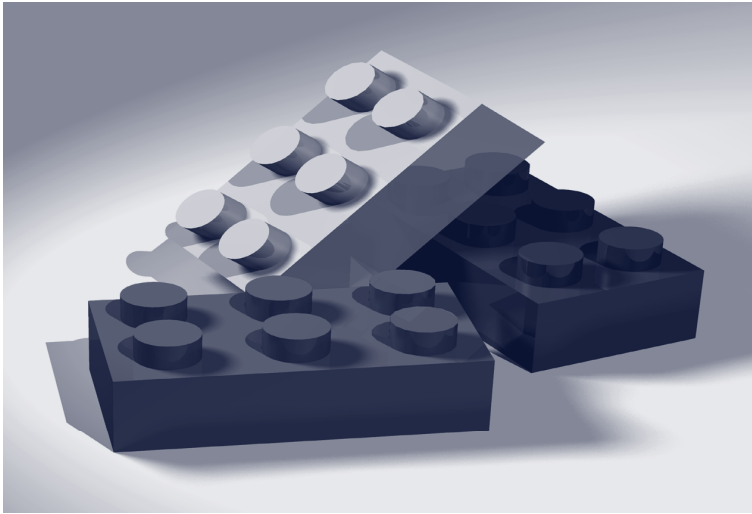
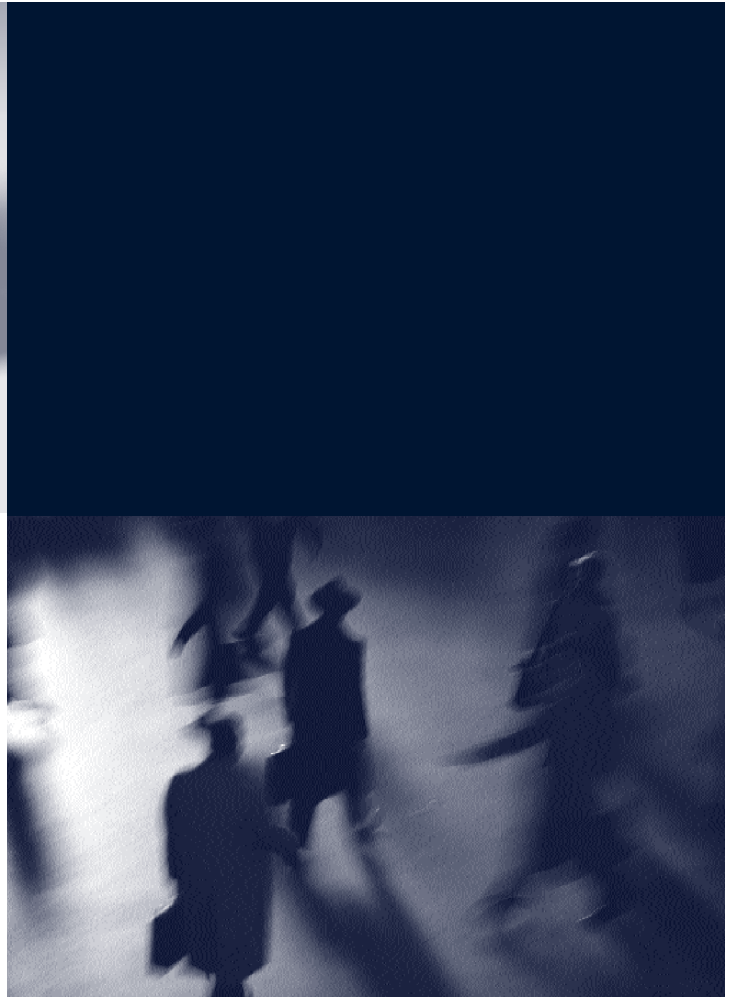




Compaq StorageWorks
Virtual Replicator
Simplifying Windows NT
Storage Management



This white paper addresses the difficulty of managing and protecting data in a Windows NT® environment, and outlines an innovative solution that simplifies NT storage management: *Compaq StorageWorks™ Virtual Replicator* software.



Compaq StorageWorks Virtual Replicator: Simplifying Windows NT Storage Management

Executive summary

As companies move to a Windows NT platform, system administrators are finding it increasingly difficult to manage and protect the exponentially growing amount of storage that is dispersed throughout the organization. In addition, the business-critical nature of today's application environment has created a requirement for availability levels up to and including around-the-clock availability. *Compaq StorageWorks Virtual Replicator* software is designed to address these issues by reducing backup and restore windows from hours to minutes, improving data and application availability, and reducing the cost and complexity of managing storage.

Benefits at a glance

- *Helps protect against data loss to keep businesses running with non-disruptive backup and user-initiated restores*
- *Enables quick response to changing capacity requirements with flexible storage pooling and up to 1-terabyte virtual disks*
- *Reduces system administration of data and storage with policy-based automation to boost productivity of IT staff*
- *Enables safe software testing, including Year 2000 readiness*
- *Uses industry-standard components for investment protection and to reduce staff retraining*
- *Results in lower total cost of ownership*
- *Delivers on Compaq's Enterprise Network Storage Architecture (ENSA) strategy for Windows NT*

Business problems

Businesses that are deploying Windows NT throughout the organization are typically facing a number of challenges, including:

- *Difficulty in managing and protecting the storage environment, given the rapid growth in data storage requirements across the company*
- *Need for high capacity (up to terabyte) disks to accommodate the growth*
- *Users' requirements for 24-hour access to data and applications — even during backup and restore operations*
- *Pressure to lower storage management costs resulting in doing more with less while continuing to attract and retain IT professionals*
- *Need to optimize storage investments and maximize storage flexibility*
- *Need to better utilize computing resources*

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Solution: Compaq StorageWorks Virtual Replicator software

Compaq StorageWorks Virtual Replicator software combines a rich set of innovative capabilities that simplify storage management for Windows NT environments. It provides new levels of storage deployment flexibility and modularity — while letting corporate IT and departmental groups gain greater control over dispersed, under-utilized storage environments. As a result, both user uptime and IT staff productivity are increased.

StorageWorks Virtual Replicator software gives companies the ability to respond quickly to changing storage capacity requirements through flexible storage pooling and support for up to 1-terabyte virtual disks. Using snapshots — or instant virtual replicas of production data — it provides the foundation to perform non-disruptive backup and user-initiated restores, and protects against data loss to keep businesses running. Policy-based backup and restore automation simplifies storage management by reducing system administration involvement and potential operator errors.

This software complements the standard capabilities of Windows NT and utilizes industry-standard server, storage, and network interconnect components — thus protecting an organization's current and future storage investments.

Delivering on ENSA

As a key deliverable of Compaq's Enterprise Network Storage Architecture (ENSA), *StorageWorks Virtual Replicator* software delivers three core capabilities across the ENSA family:

→ *Storage pooling/virtualization*

→ *Snapshots*

→ *Rapid restores*

ENSA is Compaq's strategic approach to storage management, and a key technology enabler of Compaq NonStop e-Business solutions. It leverages industry standards to combine the benefits of distributed computing with the strengths of centralized data management — while achieving the highest levels of performance and flexibility at the lowest cost. ENSA lets companies manage data with unlimited capacity through storage virtualization. The architecture provides unprecedented flexibility by letting IT managers quickly respond to changing user demands through on-the-fly expansion and storage reallocation. With centralized management of distributed storage, ENSA ensures business continuance through reliable access and control of resources.

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Who benefits from this solution

This solution is designed for companies that are impacted by the phenomenal growth in data storage and its implications for Windows NT environments, and want to gain control over planning storage capacity requirements. In addition, these businesses have a growing number of Windows NT servers — either clustered or non-clustered — and require increased manageability and availability of their storage environment. In short, these businesses need to lower their storage management costs, dramatically

reduce backup and restore windows, and improve availability of data and applications. The *StorageWorks Virtual Replicator* solution is ideal for companies that are migrating to Windows NT from UNIX® or proprietary operating systems, as well as for businesses that are moving their Windows NT operations to the “raised-floor” or data center model.

Some typical environments that would benefit from this product include file and print services, mail and messaging, Web servers, and data mining.

Compaq StorageWorks Virtual Replicator core capabilities

Feature	Function	Benefit
Storage pooling	Logical grouping of storage devices	Flexibility enabling quick response to evolving requirements, modular growth
Virtualization	Logical representation of physical disks as virtual disks	Increases utilization of storage assets
Snapshots	Instant virtual replicas of production data	Multiple purposes, quick copies enabling minimal disruption to running applications
Policy-based backup and restore automation	Automatic scheduling of snapshot operations	Increases IT staff productivity
Cluster-aware	Full support of Microsoft Cluster Server	Provides higher availability for data and applications

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Storage pooling/virtualization

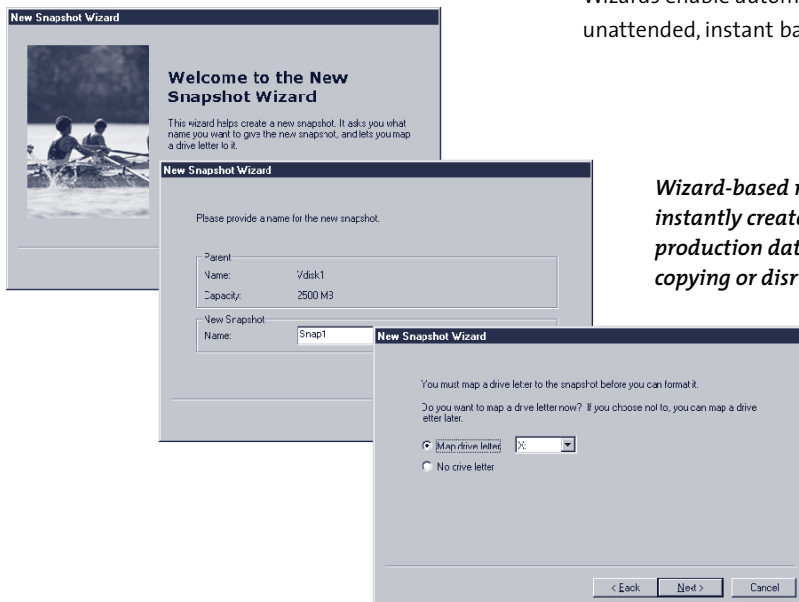
The storage pooling and virtual volume features of *StorageWorks Virtual Replicator* software allow companies to respond quickly to ever-changing storage capacity requirements. With storage pooling and virtualization, hardware array storage or physical disks can be grouped into a logically concatenated pool of disk space. Multiple virtual disks can be created from the pool, and they behave and perform exactly like physical disks.

Disk virtualization lets system administrators optimally tailor disk space to the size required by users and their applications. As an application needs more storage, resources are simply reallocated. Storage devices can be added to a pool as needed. Moreover, storage from multiple hardware array controllers can be bound into a storage pool and a virtual disk can be created that spans them. Individual virtual disks can be up to 1 terabyte in size. Any amount of storage can be allocated from the pool of storage.

Snapshots

Snapshots enable the instant creation of multipurpose virtual replicas of production data — without the requirement of physically copying data. Snapshots function identically to ordinary physical disks with both read and write capability. Whenever a quick copy of production data is needed, snapshots can be used — with minimal to no disruption to running applications. For example, while an application continues to run on a virtual disk, a backup of the disk can be performed using a snapshot of the virtual disk. The snapshot becomes the source for backup — with a standard Windows NT backup engine actually performing the backup — and is available to tape devices, or can be delivered across a TCP/IP network to a remote backup server.

Snapshots also increase application availability, because they can be used for multiple purposes while applications continue to run. Snapshots can be used to test new applications — Y2K, for example — for data mining, and to populate data marts and Web servers. Wizards enable automatic scheduling of snapshots for unattended, instant backup and restore operations.



Wizard-based management lets businesses instantly create virtual replicas of production data — without physically copying or disrupting live data

Automation and scripting

The automation and scripting features of *StorageWorks Virtual Replicator* software significantly increase IT productivity by freeing up the administrative staff. Because the product employs centralized, policy-based management, there are fewer administrative tasks to perform — which helps a company's IT staff handle today's explosive storage growth more effectively. Easy-to-use wizards create customizable, reusable scripts — allowing the company to retain management knowledge and expertise.

Optionally, *StorageWorks Virtual Replicator* software can be used in conjunction with *Compaq Batch Scheduler* software to automatically schedule unattended creation, deletion, and backup of snapshots. And because automated batch scheduling enables unattended operation, both operator involvement and potential errors are reduced.

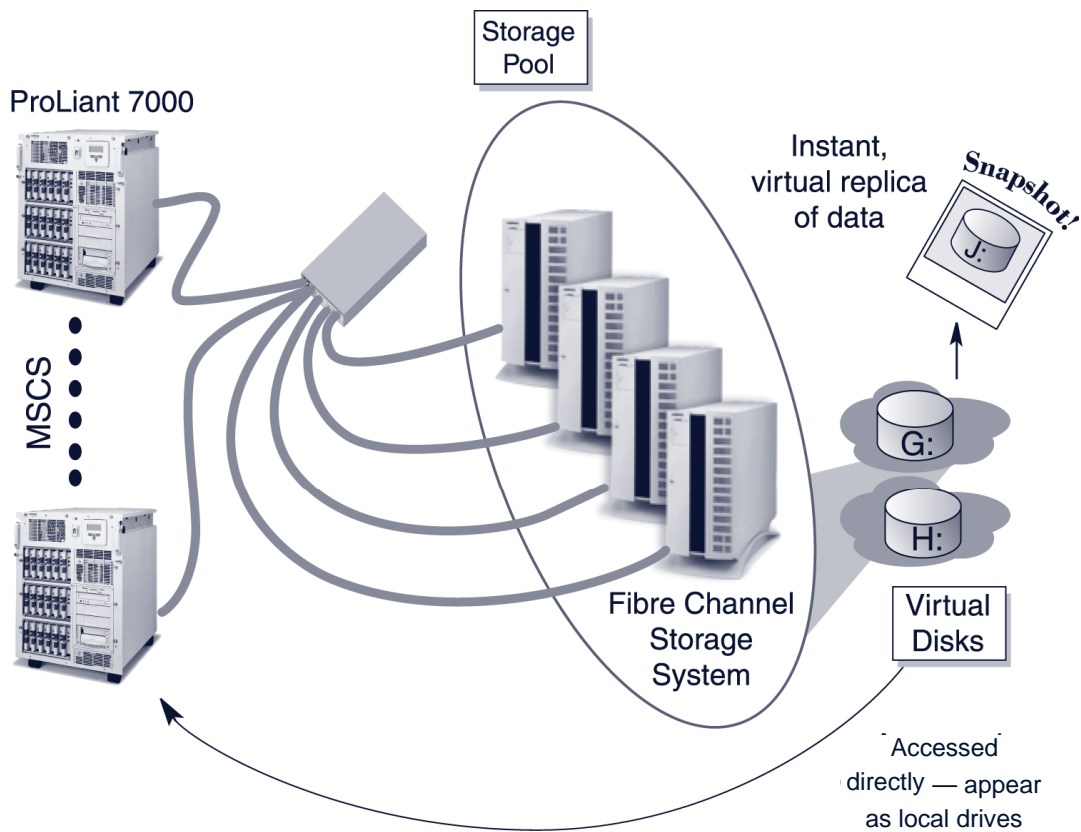
Cluster-aware

Compaq designed *StorageWorks Virtual Replicator* software to be cluster-aware. When cluster support is required, the software fully exploits Microsoft Cluster Server (MSCS) to provide higher availability for data and applications. To protect the storage pool and its contents, the software takes advantage of the MSCS failover and failback functionality if a server should go offline. Failover and failback of pools, virtual disks, and snapshots are performed as a unit in an MSCS cluster, virtual disks and snapshots are automatically recreated, and dependent applications restart. Moreover, since cluster resources are automatically created with this software, IT staff time is saved from doing cluster administration tasks.

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This configuration illustrates Compaq StorageWorks Virtual Replicator software deployed with hardware array controllers (such as Compaq Fibre Channel Storage System) that are made available as resources to Compaq ProLiant® servers running Windows NT. The storage is included in the storage pool — and from the storage pool, virtual disks are created. Once created,

virtual disks and snapshots can be accessed directly from the Windows NT servers where StorageWorks Virtual Replicator software is installed. Ideal for either non-clustered or clustered environments, it is shown here in a Microsoft Cluster Server (MSCS) environment. Note that this solution is complementary to both SCSI and Fibre Channel storage subsystems.



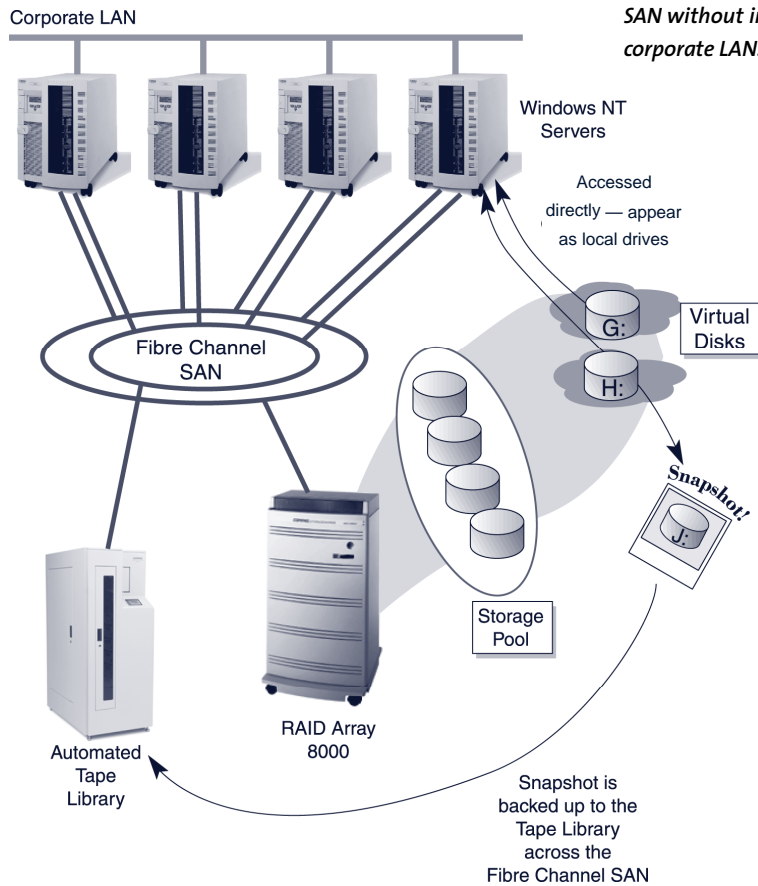
Deployment Configuration #1 – Compaq StorageWorks Virtual Replicator for Flexible Storage Deployment

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To back up a virtual disk, a snapshot of the disk is created and backed up over the Fibre Channel SAN to an Automated Tape Library. The backup is accomplished using existing backup applications that operate with the StorageWorks Enterprise Backup Solution.

Using this approach for backing up critical data has two key advantages:

- *Critical files/databases can be kept in production while the snapshot copy is backed up.*
- *The backup can take place in the background on the Enterprise Backup Solution Fibre Channel SAN without impacting any of the traffic on the corporate LAN.*



Deployment Configuration #2 – Compaq StorageWorks Virtual Replicator with Compaq StorageWorks Enterprise Backup Solution in a Fibre Channel SAN

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A better way to manage storage

As you can see from the chart below, *Compaq StorageWorks Virtual Replicator* software provides several advantages to you and your business over traditional storage management methods. The result is increased availability of production data to keep the business running, new levels of storage deployment flexibility, and reduced cost and complexity of Windows NT storage management — all of which contribute to increased IT productivity.

The Need	Traditional Method	<i>StorageWorks Virtual Replicator</i>	Business Benefit
Backup	Shut down application, backup to tape, restart application after backup completes	Pause application, take snapshot, restart application, backup snapshot	Application is offline for minutes, not hours
Restore	Restore from backup tapes	Restore from online snapshot	Accomplished in minutes
Capacity planning	Buy more than you need today or forklift upgrade later	Easy, non-disruptive modular growth	Pay as you grow
Routine storage management tasks	Manually performed by system administrators	Unattended operation via scripts and automation	Saves time/labor, reduces operator error

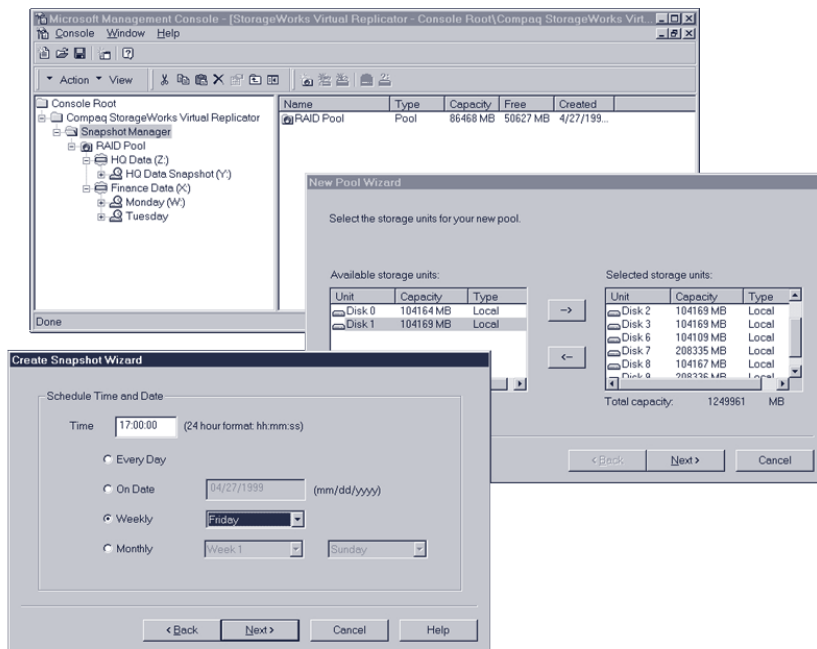
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Benefits for system administrators

System administrators will value the software's ease-of-use and automated capabilities that support Compaq's initiatives to provide customers with simplified management. It employs an easy-to-use Microsoft Management Console snap-in Graphical User Interface (GUI), a command line interface, and SNMP support for industry-leading management frameworks. A set of interactive wizards is employed to guide the user through all management operations. Additionally, enhanced scripting capabilities enable unattended scheduling of snapshot operations using *Compaq Batch Scheduler* software to increase IT productivity.

Benefits for businesses

Compaq StorageWorks Virtual Replicator software enables new levels of storage deployment flexibility and modularity, provides increased availability of production data to keep the business running, and reduces the cost and complexity of Windows NT storage management. This software further differentiates Compaq's storage solutions from the competition by providing leading edge storage management using industry-standard components.



Simplified, centralized storage management operations

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Compaq differentiators

Depth and breadth of solution

Compaq offers unparalleled storage solutions for both clustered and non-clustered computing environments. While other vendors might offer similar capabilities in separate products, only *Compaq StorageWorks Virtual Replicator* software delivers such comprehensive capabilities in a single, cost-effective Windows NT solution.

Use of industry-standard server, storage, and network components

One of the key design criteria for *Compaq StorageWorks Virtual Replicator* software was to lower system administration cost — both today and in the future. Compaq achieves this goal by providing leading edge storage management that complements the standard capabilities of Windows NT, and uses industry-standard components such as SCSI, Fibre Channel, and TCP/IP. It is complementary to industry backup solutions (e.g. Seagate BackupExec™ for Windows NT, Legato Networker® for NT, and Computer Associates ARCserve® for Windows NT), as well as NT's basic built-in backup capability. The use of industry-standard server, storage, and network interconnect components, including *Compaq StorageWorks* solutions, enable compatibility with your current and future storage investments. Moreover, it reduces the training and learning requirements of the support staff members, so they can spend their time more productively.

Proven experience

Businesses that implement this solution benefit from Compaq's unequalled expertise in delivering the most advanced storage technologies. With unsurpassed experience in Microsoft technologies, Compaq delivers cutting edge technology that is optimized for the Windows NT operating system. Compaq has years of experience helping businesses employ, manage, and integrate Windows NT-based solutions efficiently and effectively. Moreover, under the *Frontline Partnership*, Compaq and Microsoft help you deploy strategic business solutions that enable your company to function more effectively in a highly competitive and dynamic marketplace.

Global 24 x 365 service and support

Compaq delivers consistent, quality services around the world. We have local service offices in more than 100 countries for the support of global environments. And Compaq has the world's largest Windows NT certified workforce in the world, with 29,000 employees in 450 locations worldwide. Compaq also operates 29 Microsoft Authorized Support Centers, which are designated by Microsoft to provide support to its enterprise customers.

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For more information

To learn more about *Compaq StorageWorks Virtual Replicator* software, please contact your local Compaq Sales Representative, Authorized Compaq Reseller, call 1-800-344-4825, or visit our Web site:

www.compaq.com/storageworks

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