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# Migrating from StorageWorks Arrays to CLARiiON Storage Systems

*Leverage EMC's Migration Best Practices*

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## **Abstract**

HP announced the end-of-life for the StorageWorks HSG80 controller. The HSG80 can be found in a number of StorageWorks arrays including: MA8000, EMA12000, EMA16000, RA8000, and ESA12000. This white paper describes the benefits of migrating from HP StorageWorks HSG80 arrays to EMC CLARiiON storage systems. It presents migration best practices and describes proven data migration approaches. Also included are two case studies from actual migration projects.

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## Intended Audience

This document is intended for use by IT managers, storage administrators, and other professionals who are interested in migrating from StorageWorks HSG80 arrays to EMC® CLARiiON® storage systems.

## Introduction

Companies with StorageWorks HSG80 arrays are actively migrating to CLARiiON storage systems. The rate of migration has increased substantially since HP announced end-of-life for the HSG80 on June 30, 2004. EMC provides proven data migration expertise to ensure a fast and trouble-free migration. This includes best practices developed specifically for migrating from HSG80 arrays to the very popular EMC CLARiiON storage systems. This white paper describes some of the compelling reasons driving these migrations and provides migration best practices using a case-study approach.

The HSG80 RAID controller is a Digital/Compaq StorageWorks product. Thousands were sold beginning in the late 1990s. The HSG80 is used in a number of StorageWorks models including: MA8000, EMA12000, EMA16000, RA8000, and ESA12000. Since HP announced the end-of-life for the HSG80 controller, customers around the world are considering what migration and upgrade path they should take.

## Choosing EMC as Your Storage Systems Supplier

EMC is widely recognized as the leading supplier for external RAID storage systems with its CLARiiON and Symmetrix® product families. Recent reports from industry analyst Gartner reaffirmed EMC's leadership for SAN-integrated solutions and SAN management software.

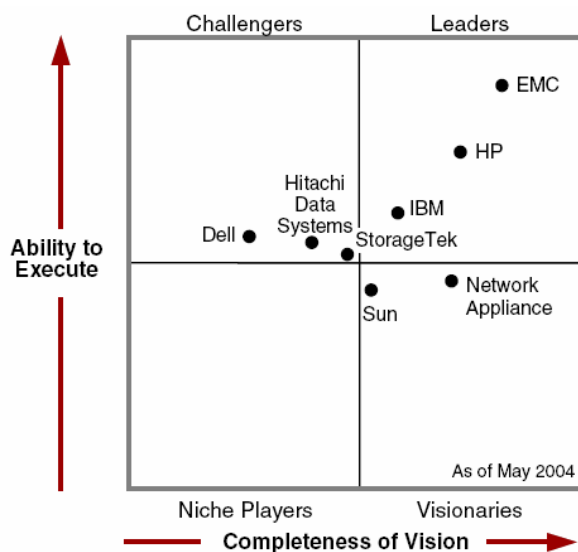
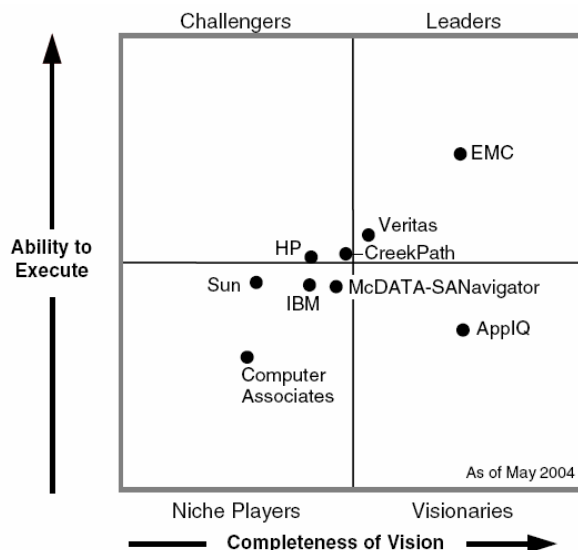


Figure 1. Gartner Magic Quadrant for SAN Integrated Solutions



**Figure 2. Gartner Magic Quadrant for SAN Management Software**

EMC's focus on storage solutions spans hardware, software, and services. EMC was the first in the industry to implement call-home features. Now called Proactive Support, EMC software constantly monitors and diagnoses the health of your storage systems on a 24x7 basis. Issues are instantaneously reported to an EMC Customer Support Center with no action required by your IT personnel. EMC pioneered SAN-based data replication and continues to lead the industry in areas such as backup to disk and content-addressable storage. With the award-winning CLARiiON storage system product family, EMC offers very affordable RAID storage systems with prices that start below \$10,000.

## Benefits of Migrating from HSG80 to CLARiiON

Many IT departments are now migrating to EMC's CLARiiON storage systems from older StorageWorks arrays. They are seeking to achieve improved services levels, better performance and expandability, improved backup and restore capabilities, and better TCOs.

### *Seamless Integration*

EMC tests and certifies every major operating system. It is very likely that EMC has already qualified the servers and operating system versions that you currently have in place.

### *Robust Storage Technology*

CLARiiON high performance architecture scales from 5 to 240 drives in modular, pay-as-you-grow increments. Standard capabilities include: no single point of failure, multipath data access, mirrored cache, automated system diagnostics, and nondisruptive software upgrades as well as global hot spares and data-in-place hardware upgrades.

### *Proven Storage Systems Software*

The CLARiiON array provides advanced local and remote data replication—both synchronous and asynchronous. Powerful storage management capabilities are standard using EMC's Navisphere<sup>®</sup> array-based management software to discover, configure, monitor, and manage multiple CLARiiON arrays from a Web browser without the need for an external server. Multivendor SAN and storage management capabilities are provided with EMC's VisualSAN<sup>®</sup> and VisualSRM<sup>™</sup> software.

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## **Top-Ranked Service Capabilities**

Your IT group is backed by the storage industry's number-one ranked services organization and supported by continuous system monitoring, call-home notification, and remote diagnostics and service.

## **Migration Expertise and Specialized Migration Tools**

EMC currently migrates over 1 PB of customer data per month to new EMC storage systems. A large percentage of this total is migrated from non-EMC storage arrays. EMC has specialized tools such as SAN Copy™, Data Relocation Utility, and RepliStor® that help to reduce replication time and downtime. There are several ways that EMC's field engineers routinely help our customers.

- We often plan and execute all facets of the data migration project.
- To lower the customer's costs, we will plan the project and then execute one or two migration events. The customer can then complete the data migration project using in-house IT specialists.
- Another option is for EMC to assist in planning and designing the migration project, after which the customer IT staff performs the hands-on data migration work themselves.

## **Migration Best Practices**

### ***Discovery and Planning***

From implementing thousands of data migration projects, EMC has learned that careful planning is the key to any successful data migration project. There is no substitute for careful planning. Start by documenting and validating the current server and storage infrastructure. It is important to double-check the firmware and drivers for HBAs and SAN switches.

The next step is to develop detailed LUN mapping information from source to target LUNs. Then document the downtime constraints and technical risks. From this information, the appropriate migration options can be determined and the best approach selected. A migration project may involve more than one migration methodology depending on server configurations and business requirements that dictate how much downtime will be allowed for each host.

Based on information discovered in the planning process, a migration plan is developed that addresses business requirements, application interdependencies, and host configurations. The original or source data should never be vulnerable during the migration. This ensures that a fast and easy fallback can be done if the need arises.

A detailed schedule should be developed that includes data migration timing estimates. In some cases, a test migration will be executed to validate the timings. Testing also helps to ensure that the process is correct and the team is ready. Another important planning deliverable is the test and acceptance plan. The test process should involve the people directly responsible for the applications and databases to be migrated.

### ***Implementation and Testing***

There is no substitute for being prepared. Ensure that a proven backup/restore process is in place. To the extent possible, inspect and validate this prior to installing new hardware and making configuration changes.

Most IT shops have change management processes in place. This will help to ensure that downtime constraints, application interdependencies, and human resources are factored into the plan and that all the necessary people are notified about what's going on.

During the implementation phase, data from the source location is migrated to a new storage system such as a CLARiiON or Symmetrix using the most appropriate technology for the environment. The data migration is then validated and approved by the customer based on an agreed upon test and acceptance plan.

## **Documentation and Support**

At the end of the project, a set of configuration documents is completed and reviewed with the customer. Our technical specialists share their expertise with our customers to ensure that a trouble-free cutover is completed. EMC also provides ongoing storage-system monitoring and a call-home capability. This keeps EMC involved in the day-to-day monitoring of your storage systems to ensure the highest levels of performance and uptime.

## **Choosing a Migration Approach**

Host-based tools are typically used for direct-attached storage (DAS) environments. For Window servers, host-based tools such as EMC Data Relocation Utility, RepliStor (EMC Legato<sup>®</sup>), and Robocopy (Microsoft), enable data migration with little or no downtime. For UNIX systems, volume managers are often used:

- Sun Solaris: VERITAS Volume Manager
- HP/UX: LVM
- Tru64: LSM and AdvFS
- AIX: LVM

SAN data migrations typically involve migrating data from an older storage system to a new one. The following criteria can help in determining whether to use a host-based tool or an array-based tool like SAN Copy.

### **Using Array-Based Migration**

Consider array-based migration when:

- Very fast data replication throughput is desired.
- Sufficient downtime period exists to allow unmounting source LUNs.
- There is a need to migrate a number of small-to-medium sized data stores in parallel at very high data replication speeds.
- Data needs to be migrated from multiple RAID controllers.

### **Using SAN Copy for Migration**

You might use SAN Copy for migration for the following reasons:

- SAN Copy enables the migration of 4, 8, or even 16 application databases in parallel, at speeds that are 10 to 20 times faster than host-based approaches.
- These migrations can be completed prior to making any changes on the hosts.
- The entire migration can be completed in a single event, whereas host-based approaches typically require two interruptions—one to install the software and start replication and a second event for production cutover.

### **Using Host-Based Migration**

Host-based migration is useful when the acceptable downtime interval is too small to permit performing data replication while the source volume is unmounted. Characteristics of a host-based approach are:

- Easier to increase volume sizes during the migration.
- Host-based tools can be installed quickly, requiring a small downtime window.
- The data migration proceeds while applications are running. After the source data is completely copied to the target, the host-based tool ensures that the source and target remain synchronized. A second, short downtime period is required to cut over from the source storage system to the target.

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## Proven Migration Tools

EMC has developed migration tools as a result of lessons learned migrating thousands of customers from DAS-to-SAN and from older storage arrays to today's high-performance storage systems. For migrating from StorageWorks to CLARiiON where UNIX hosts are involved, the most common methods are host-based volume managers or an array-based approach like SAN Copy. With Windows hosts, three types of tools are most frequently used on StorageWorks data migration projects:

- Host-based volume replication (such as Data Relocation Utility)
- Host-based file/folder replication (such as RepliStor and Robocopy)
- Array-based replication (such as SAN Copy)

On large projects, more than one migration method may be required. Downtime requirements can be very tight for certain applications. This mandates that the data be migrated while users are on the system. Host-based approaches are frequently used in these situations. In Windows environments, this often breaks down to a decision on whether to do file/folder migration or volume migration.

### ***Robocopy and RepliStor***

Many IT specialists are familiar with Robocopy. It is widely used for data migration and is available at no charge from Microsoft as part of the Windows 2003 Resource Kit. It is designed to copy files and folders across a LAN. With the acquisition of Legato, EMC added RepliStor to its product portfolio. RepliStor is excellent for local and long-distance data migrations. Installing RepliStor and performing data migration can be done with virtually no downtime. It maintains all folder and file attributes and is capable of copying Registry keys. RepliStor provides *throttling* so that replication cycles have a minimal impact on production I/O. Throttling can be permanently enabled, or turned on and off on a schedule. RepliStor contains a built-in notification capability that sends e-mails on various replication events. You can use the Perfmon Add Counters dialog box to add RepliStor-specific counters.

There is one drawback with the file replication approach. It may be necessary to make a final "sweep" prior to cutover to copy all files that were open during the replication process. In some situations, this may require more time than is permissible within the downtime window. This is where a volume-based approach can help.

### ***Data Relocation Utility***

DRU (Data Relocation Utility) was developed by EMC engineering specifically for data migration projects. It copies Windows volumes on a track-by-track basis while applications and users are online. Once the target LUNs are in sync with the source LUNs, DRU keeps the volumes synchronized.

DRU is supported on Windows NT, Windows 2000, and Windows 2003 and includes cluster support. The source volume is fully available for reads and writes during the data migration. Although DRU is a host-based tool, it is very efficient because it operates through a filter driver and intercepts I/O at the driver level. Several useful features can be easily set up through DRU's graphical user interface. For example, automatic volume expansion can be configured from within DRU. Any mix and variety of source and target volume types is supported. Another nice feature is the ability for DRU to do automatic drive-letter remapping. Up to 10 volumes can be migrated in parallel per server. The data migration process is persistent across reboots. If a server must be shut down for any reason during migration, the DRU software simply picks up where it left off.

## **SAN Copy**

In some cases, customers prefer to complete the migration during a planned downtime event, rather than perform the migration while production operations are in progress. SAN Copy is often a good fit here. It has the advantage of requiring no hardware modifications or host software installations prior to data migration.

SAN Copy has the ability to do incremental updates for propagating only changed blocks. SAN Copy will copy any LUN, including snapshots and clones. However, in data migration scenarios it is usually necessary to unmount the source LUNs prior to beginning data replication. Since SAN Copy replication rates are extremely fast, this downtime period can often fit within the permissible downtime window. SAN Copy supports a variety of non-EMC platforms and the list is growing:

- HPQ arrays based on HSG80 controller
  - RA8000, MA8000, EMA12000, EMA16000, ESA12000
  - ACS v8.5, 8.6, 8.7
- HPQ arrays based on HSV1xx controller
  - EVA 3000 and EVA 5000
  - VCS 2, VCS 3
- HPQ MSA1000 and MSA 1500 arrays
- IBM FAStT (FAStT 200, 700, 900)
- SUN (Sun T3)

## **Migration Case Study Using an Array-Based Approach**

A U.S.-based manufacturer had a large inventory of EMA 12000 storage arrays. These storage systems were hosting Windows-based applications such as Exchange, SQL, and NTFS file systems. Other mission-critical applications on UNIX were also being migrated such as SAP and an Oracle-based data warehouse. After reviewing several alternatives, this company selected CLARiiON storage systems based on a number of considerations including performance, total cost of ownership, and specific data replication technologies such as SAN Copy.

### ***Migration Requirements and Planning***

The IT staff wanted to begin by migrating all of their Windows applications over two weekends. The customer chose to complete these migrations during planned downtime events, rather than migrate the data while production operations were in progress. The IT staff along with EMC's solution architect and project manager determined that SAN Copy was the best fit for the Windows servers. The IT Manager also had specific postmigration production requirements where SAN Copy could help, and wanted to use the migration project to better understand the product's capabilities. SAP and the data warehouse were being hosted on Tru64 UNIX servers. The team decided to use the host-based migration capabilities in the Tru64 Advanced File System (AdvFS). It was already installed and the UNIX system management team had successfully used this approach in the past.

The plan was to migrate six Windows servers on the first weekend, and migrate the remaining 13 Windows servers during the second weekend. A comprehensive configuration worksheet was completed that included all relevant host information, SAN and zoning configuration, CLARiiON configuration data, and LUN types and sizes. After reviewing migration requirements, and assessing the risks, a detailed implementation and migration schedule was developed, reviewed, and approved. The new SAN and CLARiiON storage system was installed and tested. A test migration was performed and replication timing data was extrapolated to ensure that the migration could readily fit inside the downtime window. The team decided to cable two pairs of HSG80 controllers directly into the 2 Gb switches in the new SAN. This would allow the current 1 Gb production SAN to remain untouched. A test and acceptance document was completed that spelled out specific postmigration tests that would be done to validate the migration.

## **Premigration Checks**

Prior to the migration, several items were checked:

### **New SAN**

- New SAN switches powered on and checked out
- Switch firmware confirmed for compatibility with storage systems and attached hosts
- CLARiiON
  - Powered on and checked out
  - All requisite SAN Copy and other Navisphere software installed
  - Cabled up to two new SAN switches
  - Speed set to 1 Gb on ports SPA2, SPA3, SPB2, and SPB3 (to match HSG80)
  - All target LUNs created on the CLARiiON

### **Customer environment**

- Downtime window scheduled and all required people are notified
- Server with the correct Java Runtime Environment (JRE) support for bringing up Navisphere
- Correct drivers and firmware are on a share and accessible from all required host servers
- Four 1-Gb to 2-Gb FC adapters available along with four FC cables to connect HSG80s to the new SAN switch
- Detailed source-to-target LUN map completed (with drive letters and LUN World Wide Names)
- Port map from two Compaq switches (output of `zoneShow`) in a text file
- Connections map from two HSG arrays (output of `show connections`) in a text file
- Documented test plan to validate the data migration and cutover

## **Implementing the Migration**

The migration proceeded on the first weekend for the initial six Windows servers. A full backup was done on each of the servers and verified. Then, the servers were shut down prior to beginning the data migration. The data migration process included the following steps:

1. Configure zoning for SAN Copy migration.
2. Enable access to the HSG80 LUNs.
3. Create the SAN Copy sessions.
4. Start, monitor, and complete the SAN Copy sessions.

After each SAN Copy session completed, the target LUN size was confirmed and the CLARiiON event log was checked. Then the older 1 Gb HBAs were replaced with newer 2 Gb HBAs. After performing LUN masking on the CLARiiON, the new LUNs were remounted, and the hosts rebooted to ensure that everything was working correctly. Finally, the test and acceptance process was completed. The two last steps involved removing the zones between the HSG80 and CLARiiON along with the LC-to-SC cables connecting the HSG80 to the CLARiiON array. This customer was so pleased with the SAN Copy migration that they decided to use it on a subsequent data center move project which required migrating the data over 120 miles.

## **Migration Case Study Using a Host-Based Approach**

A Canadian healthcare provider had recently purchased a CLARiiON storage system to replace a pair of MA8000 arrays. After reviewing the downtime constraints for the 11 servers in scope, it was determined that the downtime period for their hospital management system could not exceed 90 minutes. SAN Copy would be used for the Exchange and file server applications, but a different approach would be required for the SQL-based hospital management application.

## ***Migration Requirements and Planning***

After reviewing the customer's environment, it was determined that EMC's DRU would be a good fit for migrating the hospital management application data. The new SAN and CLARiiON storage system were installed and tested. In addition to planning for the SAN Copy data migration of 10 Exchange and file servers, a migration scenario was documented for the DRU portion of the project. The server in question would receive newer, faster HBAs. The approach would be to install a new HBA on the server in order to access the source and target LUNs simultaneously. The time required to install an additional HBA along with the DRU software could easily be completed in less than an hour. The cutover downtime period would also be less than one hour because DRU fully automates drive letter remapping and volume expansion.

A detailed implementation and migration schedule was developed and approved, along with the test and acceptance plan. A detailed server-storage LUN mapping worksheet was completed that included drive letters, LUN sizes, and CLARiiON-specific information such as storage processors and RAID groups.

## ***Implementing the Migration***

The hospital management application would be the first to be migrated. The server underwent its normal backup cycle between 1:00 a.m. and 4:30 a.m. on Sunday morning. Then the application and database were stopped and the server shutdown. One additional HBA was installed along with the appropriate driver, and zones were created between the new HBA and the CLARiiON ports. The DRU software was installed and the server rebooted. Windows volumes were created for each of the target LUNs. After performing a rescan and verifying that the source and target volumes were accessible, the DRU synchronization process was started. The database and application was restarted at 5:35 a.m. and tested according to the test and acceptance plan.

The source LUNs were replicated and synchronized to the target CLARiiON LUNs with the application running and users on the system. This took about 10 hours. DRU continued to keep the source and target volumes synchronized until it was time for the cutover at 4:30 a.m. the following morning. The database and application were shut down and automatic start was disabled. Through the DRU interface, the migration specialist checked that the source and target volumes were in the synchronized state. The server was then rebooted. This moved the source's drive letters, and all other mount points, to the target volumes. The tests detailed in the test and acceptance plan were done to validate that the data migration was successful. The next steps included removing the older 1 Gb HBAs, installing a second 2 Gb HBA, and zoning it with the CLARiiON ports. Finally, EMC's PowerPath<sup>®</sup> software was installed to provide multiple paths from the host to the volumes located on the CLARiiON storage system.

## **Conclusion**

EMC has delivered and supported more data migration projects than any other vendor. Along the way, EMC has developed proven processes for migrating data from StorageWorks arrays to EMC's CLARiiON and Symmetrix storage systems. EMC's investments in replication tools such as SAN Copy and DRU help to ensure that customers enjoy fast and trouble-free migrations. At EMC, we realize that every data migration project is driven by your unique environment and requirements. Our service delivery engineers and certified EMC Authorized Services Network Partners are looking forward to working with you to develop a migration strategy and plan that will ensure data integrity, minimize downtime, and help you meet your financial objectives and schedule requirements.

## References and Related Documentation

### **References**

- *Using SAN Copy to Migrate Data from HP StorageWorks HSG80 Arrays to CLARiiON Storage Systems* (P/N H1318)
- *EMC Data Relocation Utility Product Guide* (P/N 300-001-081)
- *RepliStor Administrator's Guide* (found at <http://www.legato.com>)

### **Related Documentation**

- *EMC CLARiiON SAN Copy Data Mobility Software* (P/N C1023)
- *EMC SAN Copy Release Notes* (P/N 085090685)
- *EMC Support Matrix* (ESM) (found at <http://www.emc.com>)