

Compaq *SANworks*™ Data Replication Manager is controller-based data replication software for disaster tolerance and data movement solutions. It works with the new *Storage Works*™ Fibre Channel MA8000 / EMA12000 Storage Solutions. The RAID Array 8000 (RA8000) and Enterprise Storage Array 12000 (ESA12000) are also supported.

This solution provides:

- On-line, real-time data replication to a local or remote site
- Data replication over a Fibre Channel Storage Area Network (SAN)
- Cloning at Initiator and Target sites
- Snapshot support at Target site
- Switch Zoning support
- Cascaded switches support
- Full FC-to-ATM connectivity with T1E1, T3/E3, and up to OC3 line speeds
- Asynchronous and synchronous transfer modes
- Write History Logging and "MiniMerge" reconstruction
- Stretched Clusters capabilities
- Association sets
- Replicate up to 100 km (~62 miles) with Very Long Distance GBIC
- Non-RCS LUN support
- Switch Zoning support
- Dense Wave Divisional Multiplexing

Remote Replication

Data Replication Manager provides remote disk mirroring by connecting your primary RAID systems to remote storage RAID systems. Data is replicated either synchronously or asynchronously each time a transaction occurs. In the event of a disaster at your primary site, your data is safe on the remote storage system and available for immediate connection to an alternate host. Simply reconnect your remote storage system, and your business is back in operation.

Disaster Tolerance

In the event of a disaster, Compaq *SANworks* Data Replication Manager assures an on-line copy of data is available at the alternate site to support rapid resumption of critical processing at the alternate site. Resumption can usually occur within seconds or minutes, instead of hours or days, as with other disaster recovery plans.

Data Movement

Compaq *SANworks* Data Replication Manager can also be used for the movement of large quantities of data for the purposes of data warehousing and data mining applications. DRM is also ideal for moving important data off of storage subsystems temporarily for the purposes of system maintenance.

Storage Based

Data replication is performed at the storage subsystem controller level and is totally transparent to the host, alleviating unnecessary host cycles to perform the data mirroring function.

High-Performance

Replication of data functionality is performed at full fibre channel speeds (100 MB/second) across the Storage Area Network. Dual controller design provides extra processing power to service host I/O requests. A unique read-ahead cache mechanism can increase performance 30 to 40 percent for applications that sequentially read data.

Synchronous and Asynchronous Copy Operations

Data Replication Manager offers either synchronous or asynchronous data transfer modes. Synchronous data transfers offer the highest levels of data protection. With synchronous operations, both the local and remote copies are identical and concurrent at all times. Synchronous mirroring ensures that data copies are always identical, to prevent critical data loss in the event of a failure or disaster. In this mode, data is written simultaneously to the cache of the local storage system and the remote storage system, in real time, before the application I/O is completed, thus ensuring the highest possible data consistency. Synchronous replication is appropriate when exact consistency is critical to the business application.

Distance can impact bandwidth and throughput performance when performing remote replication over wide area networks. Asynchronous mode provides the highest level of performance advantage, while maintaining very high levels of disaster tolerance protection. Asynchronous data transfers writes data to the source storage system, acknowledges and completes the I/O prior to synchronizing data with the target storage system. The number of unsynchronized write operations that are outstanding ("in-flight") at any given time are pre-determined by the customer depending on their level of tolerance to lost data. Subsequent write operations will not be accepted until the target has been synchronized. Asynchronous replication is appropriate when longer distances are required for remote replication and a high level of storage performance is needed locally.

Storage Array Support

In addition to the RA8000/ESA12000, DRM supports the new MA8000/EMA12000, a family of fully integrated Fibre Channel storage solutions. It is the outgrowth of years of *StorageWorks* experience, successfully delivering quality solutions into applications with mission-critical requirements.

The MA8000/EMA12000 is the upgrade for the RA8000/ESA12000 storage solutions to the new *StorageWorks* packaging. MA8000/EMA12000 maintains the support of the HSG80 controller and associated features and adds the benefits of universal drive support, higher density of drives per enclosure, flexible configurations and higher capacity per cabinet.

The MA8000/EMA12000 is designed for the data center where there is a need to configure high-capacity systems having application-specific demands for high performance. MA8000/EMA12000 components provide the flexibility to configure solutions to provide unlimited capacity and scalable performance in a small footprint. The solutions include built-in and optional features for multi-vendor operating environments, and stringent data center availability requirements.

Operating System Support

Array Controller Software – ACS V8.5P in multi-bus mode is supported with Data Replication in the following environments:

Windows NT 4.0 (SP 3,4,& 5)

Sun Solaris V 2.6 & 7 (32 bit)

Tru64™ UNIX 5.0a

Open VMS 7.2

Note: Sun Solaris V 2.5.1 & Tru64 Unix 4.0 f/g are developed and supported by Custom Systems, a Compaq division.

Extended SANs over direct Fibre Channel – Up to 100 km

Data Replication Manager now provides the capability to replicate data over direct fibre channel, covering distances of up to 100 km (~62 miles) via the Very Long Distance GBIC. Data replication can be performed at full fibre channel speeds. This product will replace the existing 40 km optical link extender. Also available is the Long Distance GBIC for data transmission up to 10 km.

Extended SANs using Wave Division Multiplexing Technologies

Now the SANworks Data Replication Manager supports Wave Division Multiplexing (WDM) and Dense Wave Division Multiplexing (DWDM) optical networks. WDM and DWDM provide high bandwidth connectivity of enterprise level SANs over a metropolitan area via private or public fiber optic networks. Remote replication via WDM and DWDM is ideal when customers already have existing fiber optic cables between the two sites but are unable to install additional cables. WDM and DWDM maximize the existing fiber optic infrastructure.

Extended SANs over Wide Area Network Capability

Now disaster recovery sites can be located hundreds, even thousands of miles from their corresponding production sites with the use of FC-to-ATM gateways. The ATM gateway is capable of providing FC-ATM connectivity into telecommunication networks for Compaq SANworks extended SAN-WAN-SAN solutions. ATM connectivity is ideal where contingency sites are required to be very long distances to protect against wide area disasters, or where fibre channel connectivity is unavailable. In such cases, long distance replication can be defined as just across the street!

The FC-ATM Gateways now provide the widest range of wide area networking support and flexibility to meet customer requirements in the most cost-effective manner. The FC-ATM gateways now support access speeds ranging from T1/E1, T3/E3 up to OC3 (155Mbits per second).

Multiple T1 Lines – Now the FC-ATM Open System Gateway can support one or more T1/E1 lines. Multiple T1/E1 lines provide increased bandwidth via inverse multiplexing between sites, and are an ideal solution customers who do not have access or need for faster access rates.

Fractional ATM lines – The FC-ATM Open System Gateway can support “fractional” lines, such as fractional T3/E3 or fractional OC3 lines. By supporting fractional ATM lines, customers can lease the exact bandwidth or access speeds needed to support their requirements.

Shared ATM lines – The FC-ATM Open System Gateway can also support “shared” or multi-use ATM lines. A shared ATM line allows only one telecommunication link between sites, but the line bandwidth is divided between the two Fibre Channel fabrics. Another common application could be DRM and non-DRM use of the same shared ATM line. A shared ATM line is ideal when the customer's bandwidth requirements do not justify two separate dedicated ATM lines.

The Wide Area Network Capability is available in the following maximum configurations at each site:

- Two subsystems
- Four hosts
- Two fibre channel switches
- Two host bus adapters per host

Larger configurations are currently being tested and will be supported in the very near future.

Write History Logging "MiniMerge" Reconstruction

With **Write History Logging**, if the local and remote copy sets become out of sync due to link failures, etc., then the target member does not need to incur a full copy synchronization when the a link is restored. Rather, only those incoming host writes while the links are down are re-issued (referred to as "mini-merged") to the target to resynchronize the data in the same order in which they were received. The writes that would have gone to the target are logged (referred to as "write history logging") to the assigned log unit. Write History Logging has the benefit of substantially reduced resynchronization times. Also, you can have multiple logs for each association set or LUN.

Stretched Cluster Capability

Data Replication Manager supports the Compaq ProLiant Cluster HA/F500. The HA/F500 is a cluster platform comprised of ProLiant servers, *SANworks* compatible storage, fibre channel interconnects, Compaq software, and managed by Microsoft Cluster Server (MSCS). The inclusion of fibre channel switch fabric (FC-Switch) and long wave GBICs, along with new controller and platform software will now allow for Disaster Tolerant (DT) solutions to be configured at up to 10 Km distances between systems. See the HA/F500 quick spec for more details.

High Availability with No-Single-Point-of-Failure

DRM configurations assure high availability to host applications by having no-single-point-of-failure in its hardware and software components. Dual host bus adapters, fiber channel links, switches, and storage subsystems provide redundancy in hardware components. Secure Path software provides a unique host-bus-adapter failover support feature from server to storage, which provides system redundancy from a software perspective. Secure Path supports Windows NT and Sun Solaris operating systems.

Configuration

Fibre Channel (non ATM) configurations

Minimum Configuration

- Two ESA12000, RA8000, MA8000 or EMA12000 subsystems – one at the target site and one at the initiator site
- Two Fibre Channel switches at each target and initiator site
- Two Fibre Channel or ATM links between sites using Single Mode Fiber Optic cables
- Two Host Bus Adapters per host with multiple-bus failover capability

For Wide Area Network Capability (ATM)

- Two FC-to-ATM Gateways at each site
- One or more ATM links between sites

Scalable configurations

- Disk capacities – 4-, 9-, 18-, and 36-GB Ultra SCSI drives
- Single Storage Subsystem capacity – 2.5 TB (72 x 36-GB disks)
- Remote mirroring capacity – 10 TB (2.5 TB x 4 subsystems per site)
- 6 Host bus adapters per host
- 12 hosts per storage subsystems
- Up to 3 switches can be cascaded

Manageability

SANworks Command Console (SWCC) provides a graphical user interface (GUI) to setup/configure, monitor, and troubleshoot the entire storage subsystem and configuration.

Switch Zoning

Zoning provides the ability to partition the switched fabric into multiple zones and limits visibility of a controller to a particular zone. You can increase the number of servers per SAN and dedicate a zone for a specific purpose, for example, a dedicated backup zone, thus allowing re-utilization of hardware in the SAN.

Clone and Snapshot

SANworks Data Replication Manager now supports clone capability at both the initiator and target sites, and snapshot capability at the target site. Clone and Snapshot are point-in-time copy functions that can be used to minimize downtime required for system backups and data migration activities. This ensures business continuance by allowing parallel processing, and is designed for customers who cannot disrupt their computing operations for management activities.

Non-Remote Copy Sets

Remote copy sets and non-remote copy sets can now exist on the same subsystem at both the initiator and target sites. This provides added LUN support and configuration flexibility, i.e., since the remote copy sets and non-remote copy sets may be different at the initiator and target sites, not all data has to be disaster tolerant.

Association Sets

An association set is a group of remote copy sets that share common attributes. Members of an association set can be configured to transition to the same state at the same time. For example, if one association set member assumes the failsafe locked condition, all other members of the same association set assume the failsafe locked condition. An association set may also be used to simply share a log unit between a group of remote copy set members that require efficient use of the log space. The Association sets feature ensures transactional integrity in write history logging operations for those applications that require it. Association sets are currently supported on the NT operating system.

Service & Support, CarePAQ and Warranty Information

Product Support gives the customer access to Compaq's experienced technical support resources as well as access to Compaq's Information Services database for support on a variety of multivendor/multi-platform software products. Product support includes escalations and problem coordination with the appropriate engineering group. Compaq Services offer a variety of options to allow you to tailor your product service to meet the needs of your organization. Basic warranty on products can be uplifted from day one to ensure you receive the service you need when you need it.

Standard software product warranty is 90 day conformance to Software Product Description (or equivalent documentation).

Software product services

- Basic Per Product Telephone Support (annual support contract which includes standard business hours access (5 days x 9 hours), next business day response time and access to software patches)
- Per Product Installation Service (installation, configuration and startup testing)
- Telephone Service upgrades to basic per product support
- 7x24 access
- Faster response time (4-hour response)
- Service duration (1, 3 or 5 years)
- Tailored support contracts based on personalized statement of work: contact your local support center via <http://www.compaq.com/support/>

CarePaqs

- Upgrade of standard product warranty for hardware or software: 1, 3 or 5 years duration; 5x9 access or 7x 24 access; next business day or 4-hour response
- Available during warranty period only
- Prepaid rather than annual contract

Per Product Service

DRM Firmware Installation

Part Number

QT-6CAAA-I9

Solution Kit Telephone Support:

Windows NT, Windows 2000

QT-6BTAE-ZA

OpenVMS

QT-6BTAC-ZA

Sun Solaris

QT-6BTAF-ZA

Tru64 UNIX

QT-6BTAB-ZA

DRM firmware Telephone Support

QT-6CAAA-ZA

Service & Support, CarePAQ and Warranty Information *(continued)*

Components

The following brick level options/components do not have individual CarePAQs. These items will be included in product CarePAQs into which they are installed.

Disk Drives	Tape Drives	CD/DVD ROM	SCSI Hubs in SBBs	Adapters
Bus Converters	Backplane RAID Controllers	Power Supplies	Cabling	Fans

For additional CarePAQ (hardware & software) information please refer to the URL listed below:

<http://www.compaq.com/services/carepaq/index.html>

Ordering Information

DATA REP MGR HSG80 SW V8.5P PCM	128698-B21
DRM SOL KIT NTI CDRM	128696-B21
DRM SOL KIT Sun CDRM	160086-B21
DRM SOL KIT Tru64 CDRM	128693-B21
DRM SOL KIT OVMS CDRM	128694-B21
FC-to-ATM Gateways	166296-B21
FC to ATM Gateway Service Kit	166297-B21
Long Wave GBIC (up to 10 km)	127508-B21
VLD-GBIC Kit (up to 100 km)	169887-B21
REMOTE SWITCH KEY (for ATM intersite link)	166601-001