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EMC Business Continuity for Microsoft Exchange 2007

Enabled by EMC Celerra, EMC MirrorView/A, EMC NetWorker, VMware vSphere 4, and VMware SRM

Reference Architecture

EMC NAS Product Validation

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Reference architecture overview

Document purpose

EMC's commitment to consistently maintain and improve quality is led by the Total Customer Experience (TCE) program, which is driven by Six Sigma methodologies. As a result, EMC has built Customer Integration Labs in its Global Solutions Centers to reflect real-world deployments in which TCE use cases are developed and executed. These use cases provide EMC with an insight into the challenges currently facing its customers.

This document describes the reference architecture of the solution for EMC® Business Continuity for Microsoft Exchange 2007 in a VMware vSphere 4 virtual environment on an EMC Celerra® platform.

The solution is enabled by using EMC MirrorView™/Asynchronous (MirrorView/A) for replication and NetWorker® Module for Microsoft Applications intended for application consistent backup on the Celerra Common Internet File System (CIFS).

The functionality of VMware vSphere 4 Site Recovery Manager (SRM) along with a High Availability (HA) and Distributed Resource Scheduler (DRS) cluster was tested and validated by EMC Global Solutions.

Solution purpose

This solution investigates how to leverage EMC expertise and proven technologies by utilizing EMC MirrorView/A to take a replica of the Exchange database for disaster recovery and NetWorker Module for Microsoft Applications to take a application consistent backup to low-cost Advanced Technology Attachment (ATA) drives with a user mailbox size of 500 MB per user for 1,000 users. The solution also leverages a VMware HA and DRS cluster to optimize hardware resources and vSphere SRM to provide a disaster recovery solution for Exchange environment.

The purpose of this solution is to:

- Design a virtualized Microsoft Exchange 2007 environment with optimum performance and resource utilization.
- Highlight the ability of VMware vSphere 4 to provide an excellent platform to virtualize the Exchange 2007 environment. With a HA and DRS cluster, VMware vSphere provides a higher level of availability and optimizes the hardware resources significantly while simplifying management.
- Verify the ability of the VMware vSphere 4 SRM feature, which leverages the Disaster Recovery Framework that integrates with EMC MirrorView replication, to automate the failover process of VMware VMFS data stores. Its recovery plan leverages the array-based snapshot feature to test the failover process and ensures that the secondary image is consistent and usable.
- Highlight the EMC MirrorView/A feature, which provides a business continuity solution that provides LUN level replication to a remote storage system. It offers asynchronous mirroring of data between the primary CLARiiON system and the secondary CLARiiON system.

- Highlight the ability of EMC Celerra unified storage in conjunction with NetWorker Module for Microsoft Applications to provide an application consistent backup at the primary site.

This reference architecture validates the performance of all aspects of the solution and provides guidelines for building similar solutions.

This reference architecture is not intended to be a comprehensive guide to every aspect of the EMC business continuity solution for Microsoft Exchange 2007.

The business challenge

Today, an increasing number of customers are exploring ways to virtualize an Exchange environment to reduce cost, increase availability, add flexibility, and use resources more efficiently. Exchange messaging environments are growing in complexity and user requirements are increasingly demanding. Additionally, the manner in which Exchange is used to support business operations has changed. Implementing a disaster recovery solution in physical environments can both be costly as well as cumbersome but in a VMware environment it is much more convenient to implement a disaster recovery solution. Also for many businesses, incomplete backup and recovery and improper disaster recovery strategies are a norm.

These challenges demand a solution that offers an effective, affordable, scalable, and efficient solution for Exchange users with optimum performance and high availability. EMC Proven™ solutions enables you to start from a known reference configuration and then customize it for your needs by examining the various methods to accomplish common tasks in a database environment. This includes options for:

- Server virtualization
- Data backup and recovery
- Data protection
- VMware Site Recovery Manager

The technology solution

This Microsoft Exchange 2007 SP2 solution provides:

- An efficient method to store, protect, and back up e-mail messages. It simplifies e-mail management, accelerates backup and restores processes, and protects from unplanned failures.

- Simplified management of an Exchange environment with VMware vSphere 4 and Celerra unified storage, which significantly reduces the cost of hardware and information management.

- Minimal impact to Exchange server performance during replication and backup of an Exchange database using EMC MirrorView/A and NMM, respectively.

- Excellent disaster recovery of an Exchange environment with minimal downtime and optimum hardware resource utilization using a VMware HA and DRS cluster.

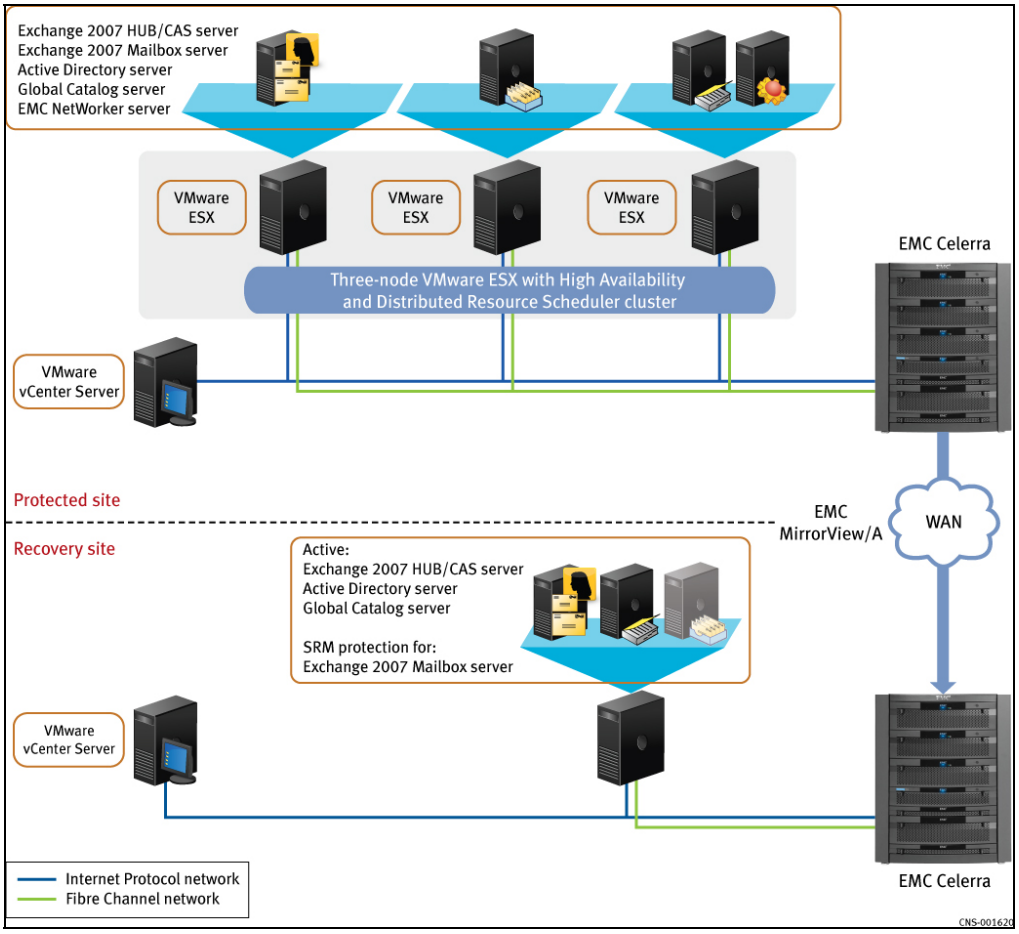
- VMware SRM to provide built-in management for executing realistic, nondisruptive tests without the cost and complexity of traditional DR testing.

- Better storage space utilization using VMware Thin Provisioning for the Exchange environment.

Solution architecture

Architecture diagram

The following figure shows the overall physical architecture of the solution.



Reference architecture overview

The validated solution is built on VMware vSphere 4 creating a Virtualized Exchange 2007 environment on an EMC Celerra platform.

The environment is created using two sites:

- SRM Protected is considered as the production site.
- SRM Recovery is considered as the disaster recovery site.

The primary site is built using a three-node VMware HA and DRS cluster. Three ESX servers are part of the cluster for high availability and resource utilization. The key components of each ESX server are:

- ESX 1 – Consists of one virtual machine.
  - Microsoft Hub Transport and Client Access Server

The Exchange Hub Transport and Client Access Server (CAS) roles are installed on the same virtual machine. The Hub Transport server handles the mail flow in the environment and applies transport rules as well as journaling policies.

The CAS is responsible for managing user connections by nine MAPI clients to the Exchange environment.

- ESX 2 – Consists of an Exchange Mailbox Server
  - Microsoft Exchange Mailbox Server

The Mailbox Server hosts the exchange mailbox database that contains users' mailboxes. It is the primary consumer of storage in the environment.

- ESX 3 – Consists of two virtual machines
  - Active Directory and Global Catalog Server

Microsoft Exchange 2007 relies entirely on Microsoft Active Directory services for all its directory operation. Active Directory provides all mailbox information, address list services, and other recipient-related information.

- EMC NetWorker Module for Microsoft Applications

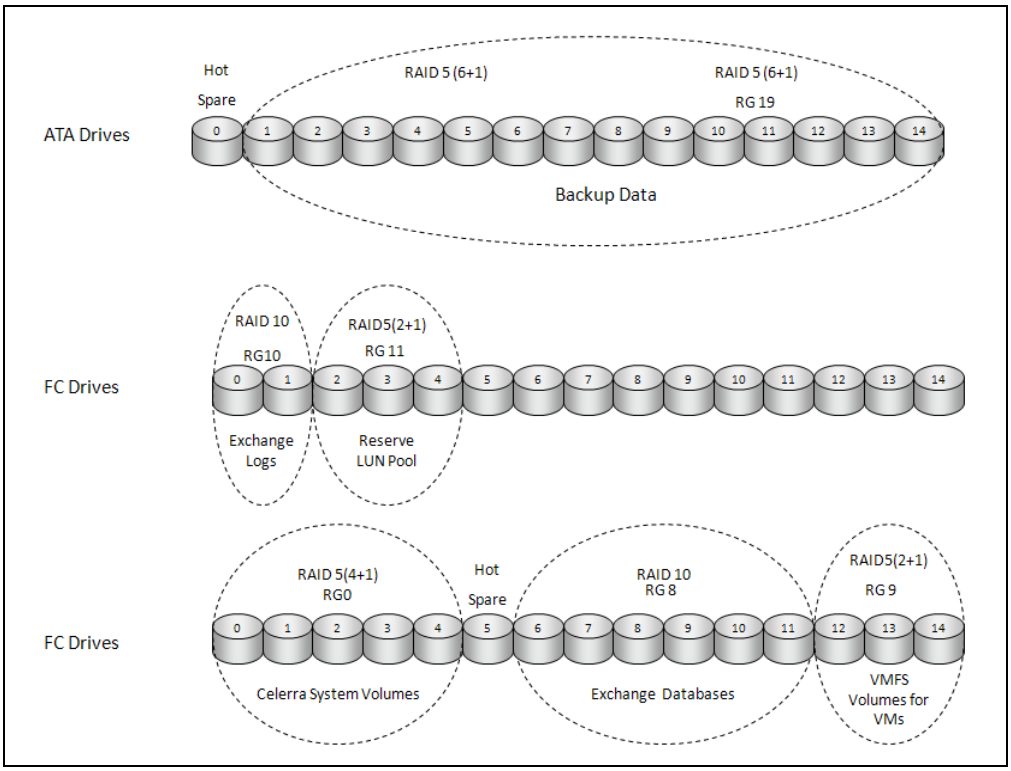
The EMC NetWorker Module for Microsoft Applications is a unified solution to protect Microsoft SharePoint, Exchange, and Active Directory. It leverages Microsoft's Volume Shadow Copy Service (VSS) to create application consistent backup.

The primary site uses an EMC Celerra NS-120 storage array and holds the Exchange mailbox database and log files along with the previously mentioned virtual machines, files. One shelf of ATA drives from this Celerra is used as a backup destination.

The recovery site is built using a VMware ESX host that holds an Active Directory and Global Catalog Server of the same domain as the primary site and a Microsoft Exchange Hub Transport and CAS for high availability. This ESX will be used as a destination for the SRM-protected Exchange mailbox server in a failover situation.

The secondary site also has an EMC Celerra NS-120 storage array for disaster recovery that is used as a destination for the replication of Exchange mailbox database and logs.

Storage layout The following figure shows the overall storage layout of the solution.



Storage layout overview The primary site, Celerra unified storage, is utilized for storing the following:

- Virtual servers' VMFS volumes
- Exchange databases and logs
- Reserved LUN pool for MirrorView/A data
- The backup of Exchange databases and logs on ATA drives

Primary site virtual servers: All of the virtual servers are stored on VMFS volumes created on the Fibre Channel (FC) LUNs shared among the three ESX hosts The operating system virtual disks were thin provisioned and a RAID 5 (2+1) group has been created for this.

Exchange database and logs: The configuration tested in this solution used six spindles for Exchange database and two spindles for Exchange logs. RAID 10 is configured for database and log spindles.

Reserve LUN pool: The MirrorView/A replication operation requires the reserved LUN pool for its operations. It stores data or information required to complete a replication task. The reserved LUN pool was configured with a storage space of three spindles with a RAID 5 (2+1) configuration.

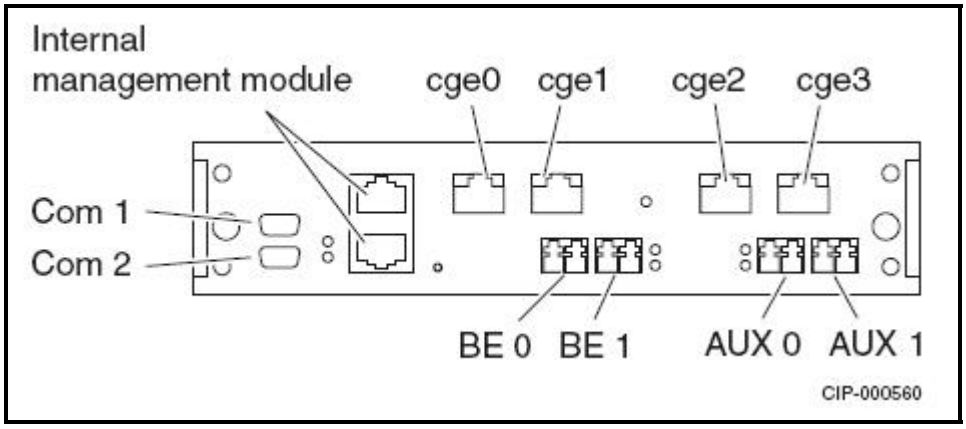
Backup destination of Exchange databases and logs: A CIFS share of a 1 TB file system is created using low-cost ATA drives. The file system is created on 14 SATA drives with two RAID 5 (6+1) configurations.

The recovery site, NS-120 Celerra unified storage, is utilized for storing the destination for the replication of the Exchange databases and logs.

Replica destination of Exchange databases and logs: The destination for the replica is created using the same approach as the primary site Exchange databases and logs.

Network layout

The following figure shows the ports on an EMC Celerra NS-120.



Network layout overview

The NS-120 Data Mover had four network ports. The figure shows the ports on the rear of the EMC Celerra NS-120 Data Mover.

In this solution, the Celerra ports are used for the Backup solution at the primary site.

Network Architecture
System-wide network design and architecture are outside the scope of this document and solution. This section's recommendations for proper functionality are consistent with industry accepted best practices and should be compatible with existing network infrastructure and policies.

Virtual local area networks (VLANs)
The validated solution uses VLAN to segregate different types of network traffic and improves throughput, manageability, application separation, high availability, and security.

Key components

Introduction

This section briefly describes the key components of the EMC Solutions for Microsoft Exchange 2007 Business Continuity solution.

- EMC Celerra unified storage platform
- EMC MirrorView/Asynchronous technology
- EMC NetWorker Module for Microsoft Applications
- VMware vSphere 4

EMC Celerra unified storage

EMC Celerra unified storage provides access to block and file data using iSCSI, CIFS, NFS, and FC protocols. Using these network services, EMC Celerra platforms deliver a complete multi-protocol storage solution. Celerra unified storage enables storage consolidation using existing IP infrastructures along with the power of high-speed FC networks

Celerra's unified product offers an ideal environment for the growing server virtualization space. It is fully certified for all supported protocols to ensure successful deployments of virtualized infrastructures through all phases of implementation.

EMC MirrorView/A replication

EMC MirrorView/A is a CLARiiON business continuity solution that provides LUN-level data replication to a remote CLARiiON storage system. The copy of the data on the production CLARiiON array is called the primary image and the copy at the recovery site is called the secondary image. During normal operations, the primary image is online and it is available for read and write operations and the secondary image is not visible to the user. MirrorView/A provides asynchronous mirroring of data between the protected CLARiiON system and the recovery CLARiiON system. With asynchronous operations, MirrorView/A keeps track of changes to the primary image. When an update is triggered, MirrorView/A replicates the changes to the secondary image.

EMC NetWorker Module for Microsoft Applications

EMC NetWorker Module for Microsoft Applications delivers a unified solution for protecting Microsoft Server Applications. It enables EMC NetWorker to leverage the Microsoft VSS framework for consistent point-in-time application snapshots, deliver quick recovery, and off-host backup. It speeds the backup, reduces bandwidth consumption, and lessens storage requirements by eliminating duplicate data at the source. It ensures business continuity and improves productivity with flexible recovery options.

VMware vSphere 4

VMware vSphere 4 is the market-leading virtualization solution, which provides significant performance enhancements that make it easier for organizations to virtualize their most demanding and intense workload.

VMware ESX 4.0 can transform or virtualize hardware resources of a x64-based computer including the CPU RAM, hard disk, and network controller to create a fully functional virtual machine that can run its own operating system and applications just like a physical computer.

This validated solution utilizes VMware HA, VMware DRS, and storage thin provisioning advanced features of vSphere 4 infrastructures to provide a comprehensive solution for Microsoft Exchange 2007.

The following table provides a summary of the advanced features and benefits of this solution.

Feature	Benefits
VMware HA	• VMware HA automatically detects physical machine failure of ESX servers and restarts the virtual machines on other ESX servers in a shared storage environment. • Ensures that storage capacity is always available in order to restart all virtual machines affected by ESX server failure. • HA continuously monitors capacity utilization and "reserves" spare capacity to be able to restart virtual machines. • Protects against operating system failures with virtual machine failure monitoring in VMware HA. • Suspends failover actions during maintenance operations on servers.
VMware DRS	• Aggregates resources across many servers into shared resource pools. Manages resources independently of the physical servers that contribute the resources. • Organizes resource pools hierarchically to match available IT resources to the business organization. DRS ensures that the resource utilization is maximized while business units retain control and autonomy of their infrastructure. Resource pools can be flexibly added, removed, or reorganized as business needs or organizations change. • Aligns computing resources with business goals while ensuring flexibility and efficient utilization of hardware resources. VMware DRS continuously monitors utilization across resource pools and intelligently allocates available resources among virtual machines based on pre-defined rules and policies. VMware DRS dynamically responds to changing virtual machine requirements using VMware VMotion to

	move virtual machines nondisruptively between servers and automating operational management of virtual machine environments.
VMware vStorage Thin Provisioning	• VMware vStorage Thin Provisioning gives higher utilization by enabling you to dedicate more storage capacity than the actual purchased capacity. With VMware vStorage Thin Provisioning operating at the virtual disk level, VI administrators gain the ability to allocate virtual disk files as "thick" or "thin." • Thin provisioning of virtual disks enables virtual machines on VMware ESX hosts to provision the entire space required for the disk's current and future activities, but at first commits only as much storage space as the disk needs for its initial operation. It achieves this with zero performance impact, continuous service availability, and complete data integrity.

VMware Site Recovery Manager

VMware Site Recovery Manager is a disaster recovery framework that integrates with various EMC replication software products (for example, MirrorView for CLARiiON) to automate the failover process of VMware VMFS data stores. SRM recovery plans leverage the array-based snapshot feature to test the failover process and ensure that the secondary image is consistent and usable. SRM relies on independent VMware vCenter servers to be in place at both the protected site and recovery site to facilitate the failover process between the two sites. SRM is made available with a set of storage replication adapters (SRAs). SRA is a software that provides the integration with a storage vendor's replication product. It integrates the CLARiiON mirroring functionality with SRM, supporting array discovery, replicated LUN discovery, test failover, and actual failover.

Validated environment profile

Profile characteristics

The solution was validated with the following environment profile.

Profile characteristic	Value
Number of Exchange 2007 SP1 users	1,000
Exchange 2007 IOPS per user	0.48 IOPS (Very Heavy profile)
Read/Write ratio	1:1
Number of Exchange mail databases per storage group	1
Exchange 2007 mailbox server	1

Number of Exchange 2007 users per server	1,000
Exchange 2007 user mailbox size	500 MB
Number of Exchange 2007 users per mailbox database	250
The VMFS volume for the virtual servers, RAID type, physical drive size, and speed	RAID 5 (2+1), 450 GB, 15k rpm
Production and DR Exchange 2007 databases' RAID type, physical drive size, and speed	RAID 10, 450 GB, 15k rpm
Backup volumes' RAID type, physical drive size, and speed	RAID 5 (6+1), 1 TB, 7.2k rpm

Hardware and software resources

Hardware

The following table lists the hardware used to validate the solution.

Equipment	Quantity	Configuration
Source storage	1	• EMC Celerra NS-120 unified storage • DART: 5.6.46.4 • 20 x 450 GB (15k rpm) • 15 x 1 TB (7.2k rpm)
Destination storage	1	• EMC Celerra NS-120 unified storage • DART: 5.6.46.4 • 20 x 300 GB (15k rpm)
Enterprise network switch	1	Gigabit Ethernet network switch
Brocade FC switch	1	Twenty-four 4 Gb/s FC ports
Virtual Servers	2	• 2 socket, 3.0 GHz dual core processor • 4 Gigabit Ethernet adapters • 16 GB RAM
	1	• 2 sockets, 3.0 GHz dual core processor • 4 Gigabit Ethernet adapters • 16 GB RAM
	1	• 2 sockets, 3.0 GHz dual core processor • 2 Gigabit Ethernet adapters

Software

The following table lists the software used to validate the solution.

Software	Version
VMware ESX 4.0	4.0.0
VMware vSphere	4.0.0
Microsoft Windows Server	Windows 2008 x64 Enterprise Edition SP2
Microsoft Exchange 2007 Enterprise Edition	SP2
EMC NetWorker	7.5 SP1
EMC NetWorker Module for Microsoft Application	Version 2.1
EMC Celerra DART	5.6.46.4
EMC CLARiiON (Source and Destination)	CX4-120, FLARE® R28 04.28.000.5.507

Conclusion

Summary

The following table provides a summary of the features and benefits of this solution.

Feature	Benefits
Virtualizing Exchange environment using VMware vSphere 4	• Virtualizing an Exchange environment reduces physical hardware cost and improves manageability and flexibility. • Save power and reduce physical footprint. • Very minimal downtime of the virtual servers in case of server failures using HA cluster. • Better hardware resource and storage utilization using DRS cluster and Thin Provisioning.
Protection of an Exchange database using EMC MirrorView/A technology	• Leverage the power of EMC Celerra networked storage to replicate valuable data to a secondary site for ultimate protection. • Perform cost-effective remote replication for recovery point objectives (RPOs) as few as 30 minutes
Exchange database backup using EMC NetWorker Module for Microsoft Applications	• Provide faster backups, reduce bandwidth consumption, and lower storage requirements by eliminating duplicate data at the source. • Ensure business continuity and improve productivity with flexible recovery options. • Leverage a single common recovery user interface for all supported Microsoft server applications
VMware Site Recovery Manager	• Quick restore of VMware Infrastructure, which automates setup, failover, and testing of disaster recovery plans

This reference architecture depicts a validated Microsoft Exchange 2007 disaster recovery solution for a virtualized midsize Exchange environment enabled by EMC MirrorView/A, EMC NetWorker Module for Microsoft Applications, EMC Celerra unified storage and VMware vSphere. The solution gives the customer greater flexibility to schedule their replication and backup jobs for full and incremental replication and backup daily. It also shows that the performance of the virtual Exchange environment has very little impact when the replication and backup jobs were running. Following are a few achievements of this solution:

Fully leveraged physical resources: Using VMware vSphere to virtualize the Exchange environment helps to reduce the physical server requirement while providing improved protection and backup for an Exchange Server environment.

Simplified mailbox server design: Using a building block approach, a Microsoft Exchange environment can be deployed using a modular design resulting in a predictable and scalable environment.

Minimal or no impact on performance: With EMC MirrorView/A technology, mailbox databases can be protected with minimal impact on the performance of Exchange.

Next steps

EMC can help accelerate assessment, design, implementation, and management while lowering the implementation risks and costs of a disaster recovery solution for a Microsoft Exchange 2007 environment.

To learn more about this and other solutions, contact an EMC representative.