EMC Business Continuity for Microsoft Office SharePoint Server 2007

Enabled by EMC CLARiiON CX4, EMC SAN Copy, EMC Replication Manager, and VMware vSphere 4

Reference Architecture

EMC NAS Product Validation
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Reference architecture overview

Document purpose
This document describes the reference architecture of a solution for EMC Business Continuity for Microsoft SharePoint Server 2007 enabled by EMC® CLARiiON® CX4, EMC SAN Copy™, EMC Replication Manager, and VMware vSphere 4, which was tested and validated by EMC NAS Product Validation.

Solution purpose
The purpose of this solution is to leverage EMC expertise and proven technologies by utilizing EMC Replication Manager to take an application-consistent replica of the SharePoint databases and Content Index files. The solution also utilizes VMware vSphere 4 to optimize hardware resources.

This solution is intended to:
• Design a virtualized Microsoft Office SharePoint 2007 environment with optimum performance and resource utilization.
• Verify the ability of the EMC CLARiiON CX4 platform’s SAN Copy replication technology with EMC Replication Manager to provide business continuity to the SharePoint environment.

This reference architecture is not intended to be a comprehensive guide to every aspect of this EMC business continuity solution. For more detailed information on this solution, please see the EMC Business Continuity for Microsoft Office SharePoint Server 2007 Enabled by EMC CLARiiON CX4, EMC SAN Copy, EMC Replication Manager, and VMware vSphere 4 Proven Solution Guide.

The business challenge
Microsoft Office SharePoint Server (MOSS) 2007 is a server application that facilitates collaboration, provides content management features, and implements business processes. It provides an integrated platform to plan, deploy, and manage intranet, extranet, and Internet applications across and beyond the enterprise. SharePoint uses multiple servers in various roles to organize and deliver website collaboration and information sharing across organizations.

Critical business information stored in SharePoint sites is rapidly increasing. Therefore, the need for enterprises to manage these SharePoint sites is greater today than ever before. When knowledge workers collaborate on projects and author documents:
• Storage requirements increase
• Data compliance and security become important issues
• Processes and policies require high-availability servers

In addition, these enterprises must manage IT costs and reduce the risk of business disruption. Implementing a disaster recovery solution in physical environments can be costly and cumbersome, but in a VMware environment it is much more convenient to implement. An increasing number of
companies are exploring ways to virtualize SharePoint environments to reduce costs, increase availability, add flexibility, and use resources more efficiently.

These challenges demand a solution that offers an effective, affordable, scalable and highly available solution for SharePoint environment with optimum performance and high availability. EMC Proven™ solutions creates 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 and
- Data protection.

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**The technology solution**

This Microsoft SharePoint 2007 SP2 solution provides:

- A method to efficiently store and protect SharePoint content. It simplifies management and accelerates protect and restore functions from corruption of the SharePoint farm, configuration databases, content databases, search databases, and Content Indexes.
- A virtualized SharePoint environment utilizing VMware vSphere technology to address cost reduction and disruption avoidance by decreasing the required number of physical servers. As a result, these enterprises can achieve substantial power and hardware savings.
- A minimal impact to SharePoint server performance during replication of SharePoint databases using EMC Replication Manager.
- Better storage space utilization using VMware thin provisioning of virtual disks for the SharePoint virtual machines.

This solution addresses each of these challenges by using tested and proven solutions validated by EMC NAS Product Validation in Research Triangle Park, North Carolina.
Solution architecture

The following illustration depicts the overall physical architecture of the solution.

![Architecture Diagram]

Reference architecture overview

The validated solution is built on VMware vSphere 4, which creates a virtualized SharePoint 2007 environment on an EMC CLARiiON CX4 platform.

Key components of this architecture are:

- A virtual Web front-end server and index server residing on one physical ESX 4.0 host.
- The virtual SQL 2005 server and application server residing on the second physical ESX 4.0 host.
- The third ESX 4.0 host holding the virtual EMC Replication Manager server and mount host.
- An EMC CLARiiON CX4-480 storage array storing the SharePoint configuration databases, content databases, search databases, and Content Index files and virtual machine VMDK files.
**Storage layout**

The following illustration depicts the overall storage layout of the solution.

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**Storage layout overview**

The EMC CLARiiON CX4-480 storage array is utilized for storing the following:

- The SharePoint virtual servers, which include a Web Front End server, SQL 2005 database server, application server and index server.
- The SharePoint Content Index files.
- The SharePoint databases, logs and tempdb.
- The reserved LUN pool.
- The SAN Copy Destination LUNs for database, logs and index files.

**SharePoint virtual servers**: All the virtual servers are stored on VMFS volumes created on the FC LUNs attached to the ESX hosts. The guest operating system virtual disks were thin-provisioned on a RAID 5 (4+1) group that holds the CLARiiON system volumes.

**Content Index files**: The SharePoint Content Index files were stored on the FC LUNs using a Raw Device Mapping (RDM) connection method. FC LUNs were created on the RAID 5 (4+1) group that holds the CLARiiON system volumes.
SharePoint databases, logs, and tempdb: The configuration tested in this solution uses RAID 5 (4+1) for storing databases and separate RAID 1 (1+1) groups for storing logs and tempdb. FC LUNs were connected to the ESX host using RDM connection method.

Reserved LUN pool: The SAN Copy replication operation requires a reserved LUN pool for its operations. It stores data that is required to complete a replication task. A reserved LUN pool was configured with a storage space of 10 percent of the space occupied by database, log, and index files of the SharePoint environment.

Destination LUNs for database, logs, and index files: Destination LUNs for SAN Copy are created in the same size as the source LUNs of database, logs, and index files.

Key components

Introduction

The key components of this Microsoft Office SharePoint Server 2007 solution are:

- An EMC CLARiiON CX4 storage platform
- SAN Copy replication technology
- Replication Manager
- VMware vSphere 4

For details on all the components that make up the reference architecture, see Hardware and software resources.

EMC CLARiiON CX4 storage

EMC CLARiiON CX4 series storage systems, powered by Intel Xeon processors, deliver industry-leading innovation in midrange storage. The unique combination of a flexible and scalable hardware design and advanced software capabilities enables CLARiiON CX4 to meet the growing and diverse needs of today’s midsize and large enterprises. Through innovations like Flash drives, UltraFlex™ technology, and Virtual Provisioning™, customers can reduce costs and energy use while optimizing availability and performance.

The dynamic nature of virtualized environments requires a flexible storage solution in order to realize the full benefit of virtualization technology. Virtualization customers who leverage the industry-leading EMC CLARiiON CX4 SAN for storage consolidation enjoy the most flexible and highest-performing deployments available for virtualized data centers.

SAN Copy replication technology

SAN Copy software runs on a SAN Copy storage system. The software copies data between CLARiiON storage systems, within CLARiiON storage systems, between CLARiiON and Symmetrix® storage systems, and between CLARiiON and qualified non-EMC storage systems. The software copies...
data directly from a logical unit on one storage system to destination logical units on another, without using host resources. SAN Copy software can simultaneously perform multiple copies, each in its own copy session. The RAID type of the logical units participating in a copy session does not matter; that is, the source and destination logical units can be any RAID type. SAN Copy sessions can be configured to operate over Fibre Channel or iSCSI.

You can use SAN Copy software to create full copies and incremental copies of a source logical unit. If you will be creating and running incremental software sessions, you must use Navisphere® Manager to configure the reserved LUN pool.

Whether you are creating a full or incremental copy session, the participating logical units must meet certain requirements.

SAN Copy software runs in the storage-system storage processors (SPs) of the storage systems, not on host servers. This reserves host processing resources for production applications while the SPs undertake the task of copying data.

When SAN Copy is installed on a storage system, the storage system SP ports become initiators and therefore behave much like host initiators. For example, they can be added to Storage Groups, and they must be part of any Fibre Channel zoning configurations, or iSCSI connection sets.

SAN Copy works with device replication products, such as EMC SnapView™ or EMC TimeFinder®. If you are creating full copies of the source logical unit, it can use a snapshot, clone, or Symmetrix BCV (business continuation volume) as its source logical unit — allowing I/O to the source LUNs of the snapshot, clone, or BCV to continue during the copy process. However, if you are creating incremental sessions, the software cannot use SnapView snapshots as the source logical unit.

EMC Replication Manager manages EMC point-in-time replication technologies through a centralized management console. Replication Manager auto-discovers the environment, including storage arrays, applications, replication technologies, and hosts, and enables streamlined management by scheduling, recording, and cataloging replica information including auto-expiration. Replication Manager is an application-centric product that allows simplified replica management with application consistency.

Replication Manager supports SAN Copy for taking application-consistent replicas of Microsoft SharePoint databases and index files. Replication Manager can mount the SharePoint replicas and restore at the farm and SharePoint database level.
VMware vSphere 4 provides significant performance enhancements that make it easier for organizations to virtualize their most demanding and intense workloads.

vSphere 4 includes ESX 4.0 and the management interface, vCenter. VMware ESX 4.0 can transform or virtualize the hardware resources of an 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 vStorage thin provisioning advanced features of vSphere 4 infrastructures to provide a comprehensive solution for Microsoft Office SharePoint Server 2007.

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

<table>
<thead>
<tr>
<th>Feature</th>
<th>Benefits</th>
</tr>
</thead>
</table>
| VMware High Availability                            | • 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 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 Distributed Resource Scheduler (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 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 demands require. |
needs or the organization changes.

- 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, automating operational management of virtual machine environments.

| VMware vStorage Thin Provisioning | VMware vStorage Thin Provisioning gives you higher utilization by letting you 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 allows 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. |

| VMotion and Storage VMotion | VMotion live migrates running virtual machines from one server to another with no disruption or downtime. This can be used to avoid application disruptions due to planned hardware maintenance.

- Storage VMotion live migrates running virtual machines from one storage location to another with no disruption or downtime. Storage VMotion can be used across different types of storage (FC, iSCSI, NFS and even local storage), allowing customers to allocate the right level of storage to applications based on their lifecycle. |
Validated environment profile

The solution was validated with the following environment profile.

<table>
<thead>
<tr>
<th>Profile characteristic</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>SharePoint farm user data</td>
<td>668 GB</td>
</tr>
<tr>
<td>Concurrency</td>
<td>10%</td>
</tr>
<tr>
<td>Enterprise portal collaboration site collections</td>
<td>One</td>
</tr>
<tr>
<td>Document library sites</td>
<td>Ten</td>
</tr>
<tr>
<td>Number of documents in the SharePoint farm</td>
<td>3,344,625</td>
</tr>
<tr>
<td>Size of Content Index files on index and WFE-Query server</td>
<td>17.26 GB</td>
</tr>
<tr>
<td>Web front end servers (VMs)</td>
<td>One (also running the query role)</td>
</tr>
<tr>
<td>Index servers (VMs)</td>
<td>One (also running Web services dedicated for crawling)</td>
</tr>
<tr>
<td>SQL servers (VMs)</td>
<td>One</td>
</tr>
<tr>
<td>Application servers (VMs)</td>
<td>One</td>
</tr>
</tbody>
</table>

Farm user load profiles

A Microsoft typical user load profile was used to determine the maximum user count the SharePoint farm could sustain while ensuring average response times remained within acceptable user limits. Using the Microsoft standard, a typical user performs 36 requests per hour (RPH). The following table details the acceptable user limits for SharePoint operations.

<table>
<thead>
<tr>
<th>Type of Operation</th>
<th>Example</th>
<th>Acceptable user response time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Common</td>
<td>Browse</td>
<td>&lt; 3 seconds</td>
</tr>
<tr>
<td>Common</td>
<td>Search</td>
<td>&lt; 3 seconds</td>
</tr>
<tr>
<td>Uncommon</td>
<td>Modify</td>
<td>&lt; 5 seconds</td>
</tr>
</tbody>
</table>
Three user profiles were tested to help determine scalability. The following table details the user profiles and the response times received.

<table>
<thead>
<tr>
<th>User profile (browse / search / modify %)</th>
<th>User load profile (36 RPH)</th>
<th>Requests per sec</th>
<th>Concurrency</th>
<th>Max user capacity</th>
<th>Acceptable user response time(secs) (browse / search / modify)</th>
</tr>
</thead>
<tbody>
<tr>
<td>80 /10 /10 Typical</td>
<td></td>
<td>8.40</td>
<td>10%</td>
<td>8,400</td>
<td>2.53 / 2.36 / 1.21</td>
</tr>
<tr>
<td>70 /05 /25 Typical</td>
<td></td>
<td>8.91</td>
<td>10%</td>
<td>8,910</td>
<td>2.54 / 2.37 / 1.36</td>
</tr>
<tr>
<td>50 /20 /30 Typical</td>
<td></td>
<td>9.30</td>
<td>10%</td>
<td>9,300</td>
<td>2.48 / 2.32 / 1.47</td>
</tr>
</tbody>
</table>

**Hardware and software resources**

**Hardware**

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

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Quantity</th>
<th>Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Storage array</td>
<td>One</td>
<td>EMC CLARiiON CX4-480 FLARE®: 4.28.000.5.501 &lt;br&gt;Four 4 Gb FC ports &lt;br&gt;Two FC shelves &lt;br&gt;Fifteen 300 GB (15k rpm) FC disks per shelf</td>
</tr>
<tr>
<td>Servers</td>
<td>Three</td>
<td>HP DL 380 servers &lt;br&gt;Four 3.0 GHz dual core processors &lt;br&gt;20 GB of RAM &lt;br&gt;2 Gigabit Ethernet NICs &lt;br&gt;1 Dual port HBA</td>
</tr>
<tr>
<td>Servers</td>
<td>Two</td>
<td>Dell 1850 Server Class &lt;br&gt;Two 2.8 GHz dual core processors &lt;br&gt;4 GB RAM &lt;br&gt;2 Gigabit Ethernet NICs</td>
</tr>
<tr>
<td>Brocade FC switch</td>
<td>One</td>
<td>Sixteen 4 Gb/s FC ports</td>
</tr>
</tbody>
</table>
| Virtual machines | Four | **WFE server** (running query service): 4 CPUs, 3.0 GHz, 12 GB RAM  
**SQL server**: 4 CPUs, 3.0 GHz, 16 GB RAM  
**Index server** (running WFE role dedicated for crawling): 4 CPUs, 3.0 GHz, 8 GB RAM  
**Application server**: 4 CPUs, 3.0 GHz, 4 GB RAM |
Software

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

<table>
<thead>
<tr>
<th>Software</th>
<th>Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>VMware ESX 4.0</td>
<td>4.0.0</td>
</tr>
<tr>
<td>VMware vSphere</td>
<td>4.0.0</td>
</tr>
<tr>
<td>Microsoft Windows Server</td>
<td>Windows 2003 x64 Enterprise Edition R2 SP2 (4)</td>
</tr>
<tr>
<td></td>
<td>Windows 2003 x32 Standard Edition R2 SP2 (2)</td>
</tr>
<tr>
<td>Microsoft Office SharePoint server 2007 Enterprise Edition</td>
<td>SP2</td>
</tr>
<tr>
<td>EMC CLARiiON FLARE R2 4.28.000.5.501</td>
<td></td>
</tr>
<tr>
<td>EMC Replication Manager</td>
<td>5.2 SP2</td>
</tr>
</tbody>
</table>

Conclusion

Summary

This reference architecture depicts a validated business continuity solution for a virtualized midsize Microsoft Office SharePoint Server 2007 environment enabled by EMC Replication Manager, EMC CLARiiON CX4, and VMware vSphere 4. The solution gives the customer greater flexibility to schedule their replication jobs for daily full and incremental replication. It also shows that replication jobs cause only a minor performance impact on the virtual SharePoint environment.

Next steps

EMC can help accelerate assessment, design, implementation, and management while lowering the implementation risks and costs of a solution for a Microsoft Office SharePoint Server 2007 environment.

To learn more about this and other solutions, contact an EMC representative or visit http://www.emc.com/solutions/microsoft.