



EMC Virtual Infrastructure for Microsoft Exchange 2007

Enabled by EMC CLARiiON CX4-120 and VMware vSphere 4.0 using iSCSI

Reference Architecture



EMC Global Solutions

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About this Solution

Purpose

This document describes the reference architecture of the EMC® Virtual Infrastructure for Microsoft Exchange 2007 Service Pack 1 (SP1) enabled by EMC CLARiiON® CX4-120 and VMware vSphere 4.0™ using iSCSI solution, which was tested and validated by EMC's Global Solutions organization.

The Global Solution Center labs reflect real-world deployments in which solutions are developed, designed, tested, tuned, and documented to address customer challenges. Customers can reduce the complexity, costs, and risks of deploying new technology with EMC Proven Solutions. Before implementing a solution in their enterprise, customers can leverage this reference architecture, which combines well-documented technology options, recommended technology products, and a characterization of the technology results based on the reference architecture.

This reference architecture will help customers to turn plans for their data centers into reality. For customers seeking to deploy their applications in a virtual, consolidated platform, with an EMC Proven Solution in their data centers, this reference architecture should be their first point of reference.

The purpose of this solution is to demonstrate a fully integrated virtualized Microsoft Exchange Server Solution, incorporating VMware vSphere 4.0 as the server virtualization platform. The EMC CLARiiON CX4-120 storage array was leveraged to address storage and consolidation. The combination of these technologies has greatly helped to further consolidate data centers across the customer's enterprise and also provides options for better asset utilization, increased protection to all servers, and more flexible deployments.

Note: This reference architecture document is not intended to be a comprehensive guide to every aspect of the EMC Virtual Infrastructure for Microsoft Exchange 2007 enabled by EMC CLARiiON CX4-120 and VMware vSphere 4.0 using iSCSI solution.

The business challenge

Keeping e-mail systems running and protected is essential for today's businesses and presents a large challenge for IT departments. In addition, to maintain operations in the face of site disasters, e-mail must be brought online quickly, with little or no data loss. Together, these challenges demand a solution that offers effective, affordable, and efficient protection of this critical business function. In addition to requiring business continuity for systems, cost is a very important consideration. Reducing capital costs and day-to-day overheads is now a major influencing factor in the solution design process.

More and more, organizations are turning to server and storage virtualization technologies as a way of reducing the operational costs being driven by information growth and the capital costs that result from unused resources. EMC helps customers to take cost out of their businesses by providing a reference architecture that leverages VMware vSphere 4.0 to achieve even greater levels of server consolidation, a tremendous increase in performance, and optimization of resources.

The technology solution

VMware vSphere 4.0 improves the efficiency and availability of systems and applications while at the same time reducing costs by consolidating resources. VMware vSphere 4.0 provides multiple ways to protect systems and ensure that information and services are constantly available to users.

The two specific business continuity components of VMware vSphere 4.0 used in this solution are Fault Tolerance (FT) and High Availability (HA).

- FT is used to protect all Exchange Mailbox Server roles. In the event of a failure of a mailbox server, the secondary copy becomes active immediately without any interruption to users. All actions completed on the primary virtual machine are also applied to the secondary virtual machine, using record/replay functionality to ensure that the secondary machine is identical to the primary.
- HA is used to protect the Exchange Hub/CAS server role and a virtual Active Directory (AD) Server. If a server fails, HA will restart the server on another available ESX Server.

This solution tested blocks of 1,000 users per virtual machine, scaling from 1,000 up to 4,000 users. All mailbox server roles were replicated and protected using VMware's new FT technology.

Key components

This section briefly describes the key components for this solution. These are:

- EMC CLARiiON CX4 networked storage
- VMware vSphere 4.0
- VMware Fault Tolerance
- Microsoft Windows Server 2008
- Microsoft Exchange Server 2007 SP1
- Microsoft LoadGen

For details on all the components that make up this reference architecture, see [“Environment profile” on page 14](#).

EMC CLARiiON CX4 networked storage

EMC's CLARiiON CX4-120 storage system provides entry-level networked storage for departmental applications or for midsize organizations. CLARiiON CX4-120 combines the CLARiiON system's proven five 9s (99.999 percent) availability with innovative technologies like Virtual Provisioning™, a 64-bit operating system, and multi-core processors. The CX4-120 model scales in capacity from 5 to 120 TB.

The features and benefits of the CLARiiON CX4-120 storage system are listed in [Table 1](#).

Table 1 Features and benefits of CLARiiON CX4-120 in this solution

| Feature | Benefit |
|----------------------------------|---|
| Enterprise Flash drives | Extend your tiering capabilities by establishing a new tier 0 for ultra-high performance. |
| Fibre Channel/iSCSI connectivity | Deploy flexibly with four 4 Gb/s Fibre Channel and four 1 Gb/s iSCSI host ports. |
| Tiered storage | Mix low-power SATA drives and high-performance Fibre Channel drives in the same system to meet your needs and budget. |
| MetaLUN technology | Increase performance and capacity utilization with online LUN expansion. |
| Virtual LUN technology | Easily manage tiered storage deployments with nondisruptive data migration within the array. |
| Three-year enhanced support | Get unlimited online self-help, proactive remote support, software upgrades, 24x7 call center response, and 9x5 onsite support. |
| Data-in-place upgrade | Protect your investment with our unique data-in-place upgrade to the CX4 model 240, CX4 model 480, or the CX4 model 960. |

CLARiiON CX4-related products

CLARiiON CX4 EMC-related products include the following:

- **CLARiiON Virtual Provisioning**
CLARiiON Virtual Provisioning provides additional benefits beyond traditional "thin" provisioning, including simplified storage management and improved capacity utilization.
- **MirrorView™**
MirrorView protects businesses with synchronous and asynchronous remote replication options across IP and Fibre Channel networks.
- **Navisphere® Management Suite**
Navisphere Management Suite helps businesses to discover, monitor, configure, and report on multiple EMC CLARiiON storage arrays from a browser.
- **Navisphere Quality of Service Manager**
Navisphere Quality of Service Manager helps businesses to manage their application service levels more effectively by measuring, monitoring, and controlling I/O requests from applications.
- **PowerPath® Encryption with RSA for MPIO multipathing**
PowerPath encryption with RSA for MPIO multipathing protects sensitive data against unauthorized access if a disk drive or array is removed.
- **RecoverPoint/SE**
RecoverPoint/SE ensures continuous data protection and continuous remote data replication for EMC CLARiiON networked storage.
- **SAN Copy™**
SAN Copy enables high-speed data mobility, migration, and protection between the EMC CLARiiON networked storage and qualified storage systems.
- **SnapView™**
SnapView enables businesses to increase application availability and reduce backup windows with CLARiiON-based local snapshots and full volume clones.

VMware vSphere 4.0

VMware vSphere 4.0 is the industry's first cloud operating system, which uses the power of virtualization to transform data centers into dramatically simplified cloud computing infrastructures and enables IT organizations to deliver the next generation of flexible and reliable IT services, using internal and external resources, securely and with low risk.

VMware vSphere 4.0, the next generation of the powerful and proven VMware Infrastructure 3 platform used by more than 130,000 customers, substantially reduces capital and operating costs and increases control over the delivery of IT services while preserving the flexibility to choose between any type of OS, application, and hardware, hosted in-house or using external resources.

VMware High Availability and Fault Tolerance

VMware HA and VMware FT offer simple, cost-effective solutions that help mitigate situations that could otherwise make data or services unavailable to users.

VMware HA checks that ESX/ESXi hosts in the cluster are functioning. If an ESX/ESXi host fails, any virtual machine that was running on the server that failed is restarted on another host.

VMware FT provides zero-downtime and zero-data-loss continuous availability in the case of hardware failures. FT creates a hidden duplicate copy of each running virtual machine so if a virtual machine fails due to hardware failures, the duplicate virtual machine can immediately replace the one that was lost.

Microsoft Windows Server 2008

Windows Server 2008 is designed to power the next generation of networks, applications, and Web services. With Windows Server 2008 it is easy to develop, deliver, and manage rich user experiences and applications, provide a highly secure network infrastructure, and increase technological efficiency and value within an organization.

Microsoft Exchange Server 2007 SP1

Microsoft Exchange Server 2007 has been designed specifically to meet the challenges and address the needs of organizations requiring a messaging system. The new capabilities of Microsoft Exchange Server 2007 SP1 deliver the advanced protection a company demands, the "anywhere" access people want, and the operational efficiency required.

Microsoft LoadGen

Exchange Load Generator (LoadGen) is used as a simulation tool to measure the effect of MAPI clients on Exchange servers. Using LoadGen, it is possible to test how a server that is running Exchange responds to e-mail loads. These tests send multiple messaging requests to the Exchange Server, which causes a mail load.

LoadGen is useful for administrators who are sizing servers and validating a deployment plan. Specifically, LoadGen helps to determine whether each of the servers can handle the load that they are intended to carry. LoadGen can also be used to validate the overall solution.

Solution details

VMware FT was used in this solution to demonstrate the capabilities of this new feature with the Microsoft Exchange Mailbox Server by increasing server and service uptime. This increased availability was achieved with VMware FT, which has a primary and secondary node, where both nodes are running at all times and where all changes to the primary node are tracked and shipped to the secondary node.

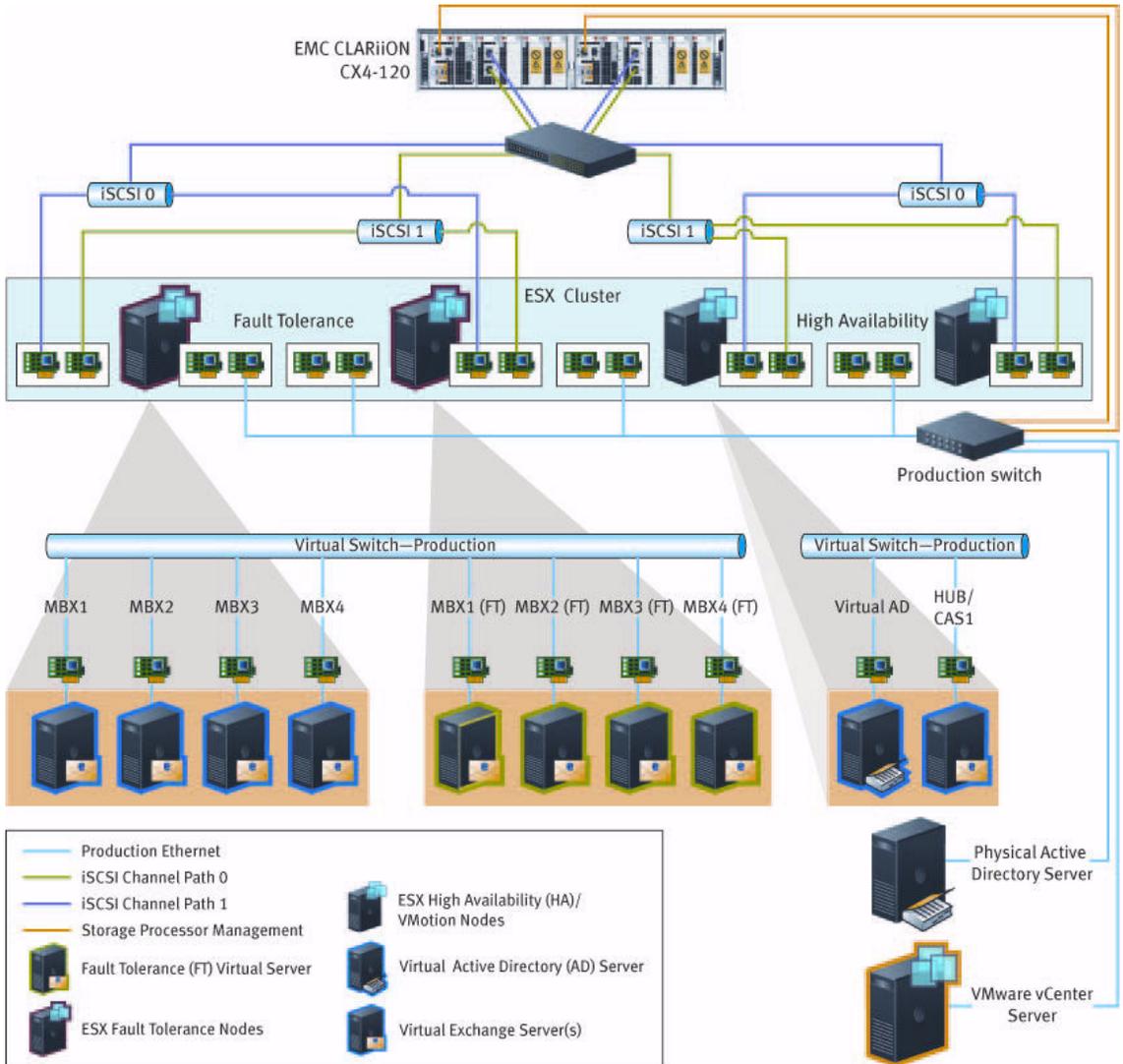
A VMware HA cluster was used for all four nodes, with node 1 and node 2 configured with VMware HA/VMotion, and nodes 3 and 4 configured with FT. This configuration was set up to show the ability of a VMware HA cluster already running and configured to run Exchange Mailbox Servers. Hub/CAS and Active Directory servers could be set up quickly to use the new FT feature, without having to copy between cluster data stores, if set up independently. In addition, this configuration proves that both VMware HA and VMware FT work with nodes configured to run with separate configurations, while also providing different levels of HA based on server roles.

This section describes the following:

- Physical architecture
- Hardware layout
- Disk layout

Physical architecture

The overall physical architecture of this solution is illustrated in Figure 1.



CL4331

Figure 1 Physical architecture of the CLARiiON CX4-120 and VMware vSphere 4.0 with iSCSI solution

Hardware layout

The layout of the hardware used in this solution is illustrated in [Figure 2](#).

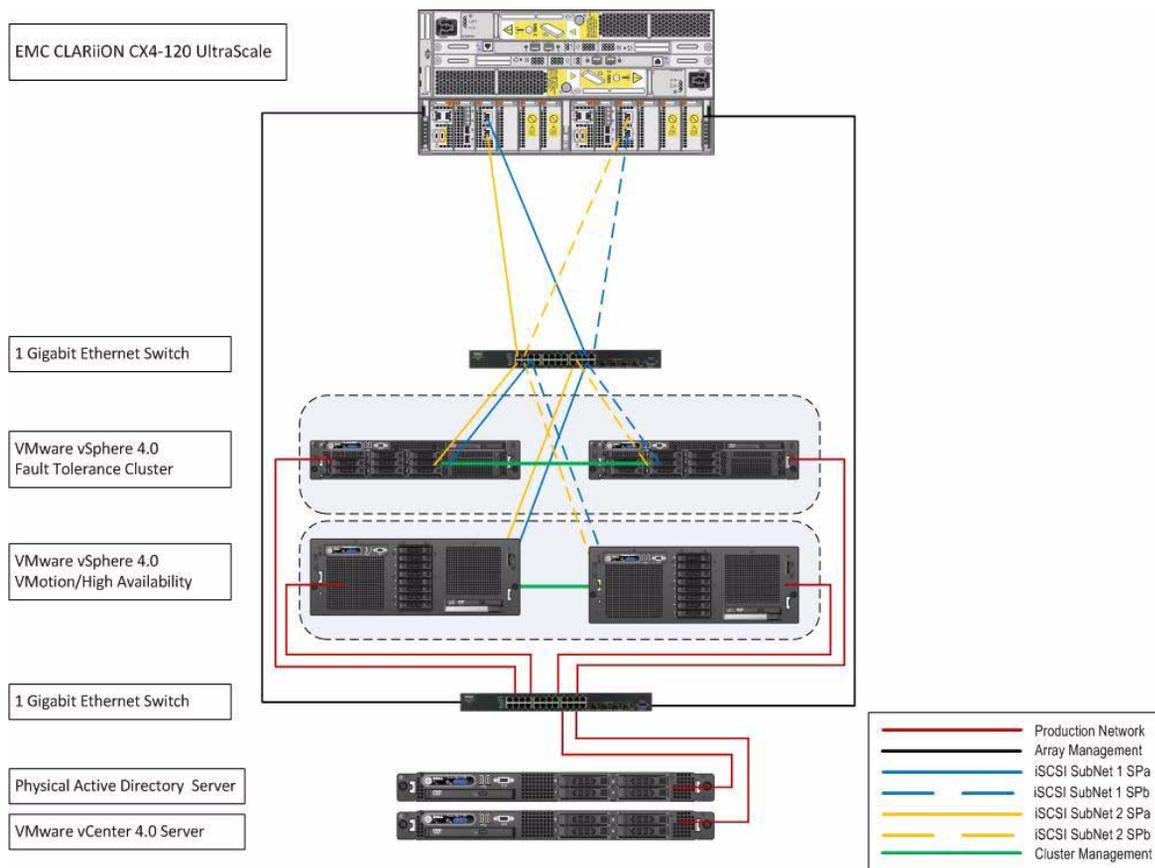


Figure 2 Hardware layout

Disk layout

The disk layout of this solution is illustrated in [Figure 3](#).

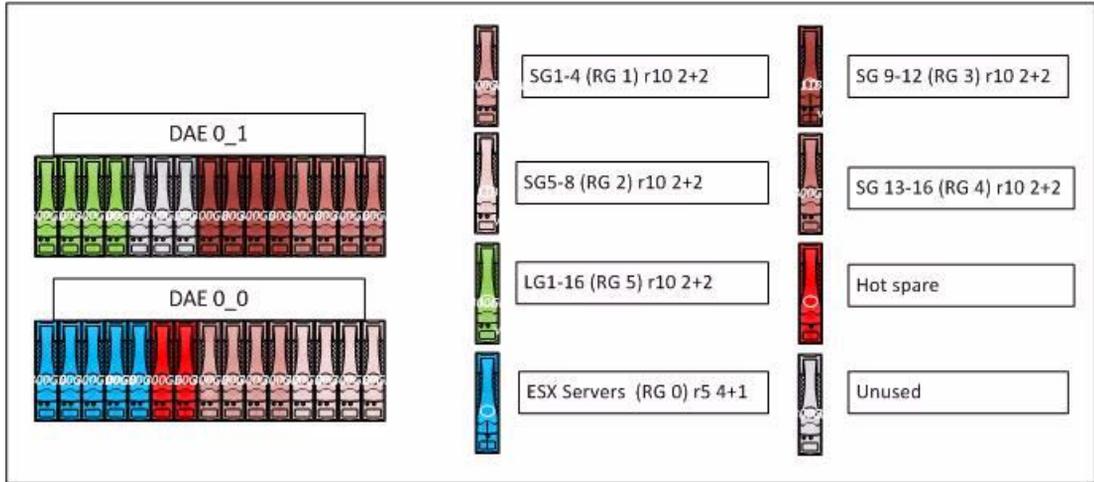


Figure 3 Disk layout

Environment profile

This configuration is based on previous testing that was run on Exchange 2007 SP1 and 300 GB 15k FC drives. The configuration was tested with VMware virtualization and no problems were encountered.

The solution was validated with the environment profile listed in [Table 2](#)

Table 2 Environment profile

| Profile characteristic | Value |
|---|--------|
| Number of users per building block | 1,000 |
| Exchange 2007 SP1 mailbox servers | 4 |
| Number of Exchange 2007 users per server | 1,000 |
| Number of storage groups per server | 4 |
| Number of Exchange 2007 databases per storage group | 1 |
| Number of Exchange 2007 mailboxes per mail database | 250 |
| Mailbox quota | 500 MB |
| Exchange 2007 production data: | |
| • RAID | 1_0 |
| • Size | 300 GB |
| • Speed | 15k |
| • Connection | FC |

The solution was created with an existing VMware virtualized environment, configured with VMware HA on all servers within the solution. A customer who already has the hardware provisioned and wants to use the new VMware FT feature, which has a requirement for the new generation of processors, can quickly add the new servers for FT into the VMware HA cluster, and move the Exchange Mailbox Server without delay. This allows the customer to reprovision the existing VMware HA cluster for other virtual servers needing the features offered with the VMware HA cluster, while leaving the Microsoft AD server and Exchange Hub/CAS server in place.

Additionally, this configuration also was set in place to show that a single VMware HA cluster could have virtual servers configured with FT on servers capable of this feature, while also having virtual machines configured with VMware VMotion, DRS, and HA using completely different ESX servers and, at the same time, maintaining the fault tolerance that a customer needs. A configuration like this could be adapted to a customer's environment where

subsets of servers require different levels of RPO/RTO times, all managed within a single VMware vCenter console.

Hardware resources

The hardware resources used in this environment are listed in [Table 3](#).

Table 3 Hardware configuration

| Equipment | Quantity | Configuration |
|-----------------------|--------------|--|
| Rack | 1 | 42 U |
| EMC CLARiiON CX4-120 | 1 | 2 storage processors 2.879 GB mirrored cache |
| DAEP | 2 | 1 |
| 300 GB FC HDD | 30 (27 used) | 15k FC |
| FT Server | 2 | 2 quad-core Xeon X5450 (3 GHz) processors 32 GB RAM 2 quad-port 1 Gb NICs |
| HA Server | 2 | 2 dual-core Xeon E7220 (2.93 GHz) processors 64 GB RAM 2 quad-port 1 Gb NICs |
| AD and vCenter Server | 2 | 2 quad-core Xeon E5345 (2.33 GHz) processors 16 GB RAM 2 Intel 1 Gb NICs |
| Network Switch | 2 | 24-port 1 Gigabit Ethernet Layer 3 with 4 combo-ports |

Software resources

The software resources used in this solution are listed in [Table 4](#).

Table 4 Software configuration

| Software | Configuration |
|---|--------------------|
| Microsoft Windows Server 2008 | RTM |
| VMware vSphere 4.0 | 4.0 (build 140882) |
| Microsoft Exchange Server 2007 mailbox role | SP1 |
| Microsoft Exchange Server 2007 Hub/CAS role | SP1 |
| PowerPath | 5.2 x64 |
| Microsoft iSCSI Initiator | Built in |
| Navisphere CLI | 6.28.0.4.4 |
| Navisphere Agent | 6.28.0.4.4 |
| VMware vCenter Server | 4.0 |
| VMware vSphere Client | 4.0 |

Conclusion

This solution was designed to provide a highly available and flexible architecture for a midsized Microsoft Exchange environment of 4,000 users. Leveraging VMware's vSphere 4.0 platform, this solution provides businesses with the highest level of fault tolerance and data protection for Microsoft Exchange data while improving operational efficiency and simplifying the underlying IT infrastructure, yielding 100 percent availability of e-mail services.

Four mailbox servers were virtualized in this configuration. Each virtual mailbox machine was configured to support a 1,000-user Exchange Mailbox as a building block. Each mailbox VM was then protected with VMware FT, a new feature introduced in VMware vSphere 4.0. VMware FT provides continuous availability, without any data loss or downtime, to any application, in the event of hardware failures, without increasing the complexity or cost of the underlying infrastructure. The performance of the mailbox servers was tested and performed within the expected performance and workload guidelines specified by Microsoft, and were not significantly impacted by enabling VMware FT.

VMware vSphere 4.0 abstracts applications and information from the complexity of the underlying infrastructure, creating an internal cloud infrastructure so that IT can focus on the support and enablement of business value. By combining the power of VMware vSphere 4.0 with EMC CLARiiON CX4-120 with iSCSI storage infrastructure, this solution provides the most efficient, highly available, and cost-effective method of deploying mission-critical Microsoft Exchange mail solutions.

With expanded performance scalability and new availability features, VMware vSphere 4.0 and EMC CLARiiON CX4-120 using iSCSI allow customers to accelerate the consolidation and virtualization of Tier 1 applications and gain significant cost savings in capital expenses over traditional, physical Tier 1 dedicated configurations. In addition, customers can achieve savings in operating expenses due to the greater simplicity of managing a virtualized HA infrastructure on EMC storage. The scalability of VMware vSphere 4.0 with EMC CLARiiON CX4-120 using iSCSI gives customers the knowledge that as their company grows, or as the demand on their IT infrastructure increases, their investments in building this internal cloud will meet the long-term demands of their business.

Next steps

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

To learn more about this and other solutions contact an EMC representative or visit:

www.EMC.com/solutions/microsoft