White Paper

Secure and Consolidated 16,000 Exchange Users Solution on a VMware/EMC Environment

Applied Technology

Abstract

A virtualization-enabled platform for Microsoft Exchange 2007 can provide a number of technical and operational benefits over a similar non-virtualized configuration. The purpose of this white paper is to validate the building-block guidelines for virtualizing an Exchange 2007 Mailbox server role using a real-world deployment scenario. The design presented here enables customers considering an Exchange 2007 deployment to capitalize on the benefits of a virtualized platform with VMware Infrastructure 3 and EMC® CLARiiON® storage.

August 2008

Part Number H4427.2

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Executive summary

With the release of Exchange 2007, Microsoft has made a number of enhancements in functionality, availability, and performance. Notable among these enhancements is that Exchange 2007 now runs exclusively on a 64-bit platform. For customers planning a migration onto Exchange 2007, a window of opportunity exists to leverage the benefits of virtualization during this migration. A virtualization-enabled platform for Exchange 2007 can provide a number of technical and operational benefits over a similar non-virtualized configuration. These benefits include the following:

- **Reduced costs:** Virtualization can help companies lower costs associated with their Exchange server infrastructure by consolidating Exchange servers into virtual machines running on powerful 64-bit server hardware. These cost savings include server hardware and maintenance costs, reduced rack space and floor space, reduced data center power and cooling costs, and reduced infrastructure costs (host bus adapters, cables, switch ports, and so forth) among others.
- **Increased flexibility:** Virtual machines run independently of the underlying physical server hardware, providing substantial improvements in overall flexibility. Virtualized Exchange servers are no longer tied to a physical server and can be dynamically load balanced across VMware ESX servers with VMware Distributed Resource Scheduler (DRS). Or they can be manually moved across VMware ESX servers at any time with VMware VMotion, allowing the Exchange environment to rapidly adjust to changing requirements.
- **Simplified Mailbox server design:** Using the building-block approach described in this document, Exchange environments can be deployed using a modular approach. Each building block in this design supports 4,000 Very Heavy users and has been pre-sized and tested to ensure optimal performance. Using the building-block approach takes the guesswork out of sizing Mailbox servers and associated storage. The building-block approach allows the environment to scale easily using a predictable approach, where each building block has a well-understood performance profile. Every deployment will have different requirements. The information provided here can be used as a starting point in creating a design that best fits your customer.
- **Improved service-level availability and performance:** Running Exchange 2007 on a VMware Virtual Infrastructure allows an organization to improve service levels and reduce the risk of downtime associated with planned and unplanned outages. VMware VMotion allows Exchange server roles to be managed independently of the underlying physical server infrastructure. When a physical ESX host server requires planned maintenance, the Exchange virtual machines can be migrated to another host server without downtime or impact to production users. In the case of an unplanned hardware outage or unexpected guest OS failure, VMware HA can automatically restart and the DRS will load balance Exchange virtual machines on the remaining physical ESX servers within the VMware HA/DRS cluster. To ensure that Exchange performance levels are met, resource pools can be configured to ensure that resources are aggregated and prioritized to Exchange services during peak workloads. Additionally, the DRS can automatically balance workloads across the underlying physical infrastructure to avoid resource contention during peak workload periods for all Exchange server roles.
- **VMware high-availability (HA) performance:** With any critical application like Exchange, there must be a mechanism for the application to quickly recover from the hardware failure. In the case of an unplanned hardware outage or unexpected guest OS failure, VMware HA can automatically restart the virtual machine and DRS will load balance the Exchange virtual machines on the remaining physical ESX servers within the cluster. Within this solution, two R900s were placed in a VMware HA cluster. Both servers were configured the same—the first server had all the Exchange mailbox virtual machines, and the second server had the HUB\CAS and DC servers (as shown in Figure 1). During the testing, the ESX server hosting the mailbox server virtual machines was powered off. It took 5-7 minutes for Exchange to come online on the second Dell R900 and to begin servicing clients. This testing was performed under a Very Heavy LoadGen workload. VMware HA can be used on its own or combined with other application availability solutions such as Microsoft Clustering Services to meet an organization's service level availability requirements.
- **Unprecedented server scalability and ROI:** Today's new 64-bit servers required for Exchange 2007 continue to be shipped with multi-core processors and increased memory density. Exchange 2007 does not scale well in an unvirtualized deployment beyond eight processor cores and 32 GB RAM. The

server under test in this solution is a Dell R900 with 16 processor cores and 128 GB RAM. Running multiple virtual machines on these servers allows the full value to be unlocked from this hardware and provides scalability that far exceeds unvirtualized configurations. The design presented here demonstrates how a single ESX server can support up to 16,000 Exchange users on a single physical server.

Introduction

EMC has worked together with VMware engineering to test a solution for Exchange server consolidation using the building-block approach. The design presented here enables customers considering an Exchange 2007 deployment to capitalize on the benefits of a virtualized platform with VMware ESX 3.5 and EMC® CLARiiON® storage.

The purpose of this white paper is to demonstrate the value of virtualizing your Exchange environment. It also validates—from a performance standpoint—the building-block guidelines for virtualizing an Exchange 2007 Mailbox server role using a real-world deployment scenario. VMware ESX 3.5 was used to host the Exchange Server 2007 virtual machines. All peripheral (AD, Hub, and CAS) server roles were also hosted on VMware virtual machines. EMC CLARiiON CX3-80 storage was used to host the Exchange servers' virtual machines as well as the database and log storage and their associated backup clones. EMC Replication Manager software was used to test backup/restore functionality for the Exchange database and logs.

In a real-world deployment scenario, the Replication Manager clone copies can then be backed up to tape or disk at the local site, or replicated to a secondary site using EMC SAN Copy™ software to provide disaster recovery.

This solution integrates industry-leading RSA security technology throughout the architecture. This technology builds four comprehensive elements of security into the solution: policy management, data discovery and classification, data control with access management and encryption and data leakage prevention, and finally, log and audit management.

Design considerations used in this solution for the Exchange 2007 environment, EMC CLARiiON storage, VMware Infrastructure 3, and EMC Replication Manager software are discussed in the first part of this paper. Sizing for the 4,000-user building block, based on these design considerations, is covered next. The remaining sections present the results of performance testing and validation of this solution. The test results were gathered using a number of tools, including: Microsoft Jetstress and LoadGen, Windows Performance Monitor, VMware esxtop, and CLARiiON NaviAnalyzer.

Results of this testing validate the performance and scalability of a VMware Virtualized Exchange 2007 server deployment. The test results demonstrate how Exchange 2007 can scale when virtualized to break through the eight core and 32 GB memory limitations that Exchange 2007 is subject to in a physical non-virtualized server deployment.

Local Exchange high availability with VMware HA was also tested as part of this solution and these results will also be described in the paper. This is an excellent solution for environments that can tolerate a Mailbox server restart. A number of options exist for providing Mailbox server high availability on the VMware platform; the decision on which solution to use should be based on the specific requirements of each organization's Exchange recovery point objective (RPO) and recovery time objective (RTO) SLAs.

Audience

This white paper is intended for Exchange administrators, Exchange architects, systems administrators, systems architects, customers, and anyone involved in the design and implementation of an Exchange 2007 solution. See the "References" section of this paper for related information, including administrator guides and white papers.

Configuration

The major components involved in the configuration of this solution include Microsoft Exchange 2007 virtualized by VMware ESX 3.5 with EMC CLARiiON CX3-80 for storage. The other components discussed here are local instant backup and recovery—which will be provided by EMC's Replication Manager product—and VMware HA for local server failover. Replication Manager provides the ability to back up and restore Exchange 2007 quickly and efficiently. Each of these components is described in detail in the following sections. These configuration details can be used as a reference point to begin planning similar solutions. See Figure 1.

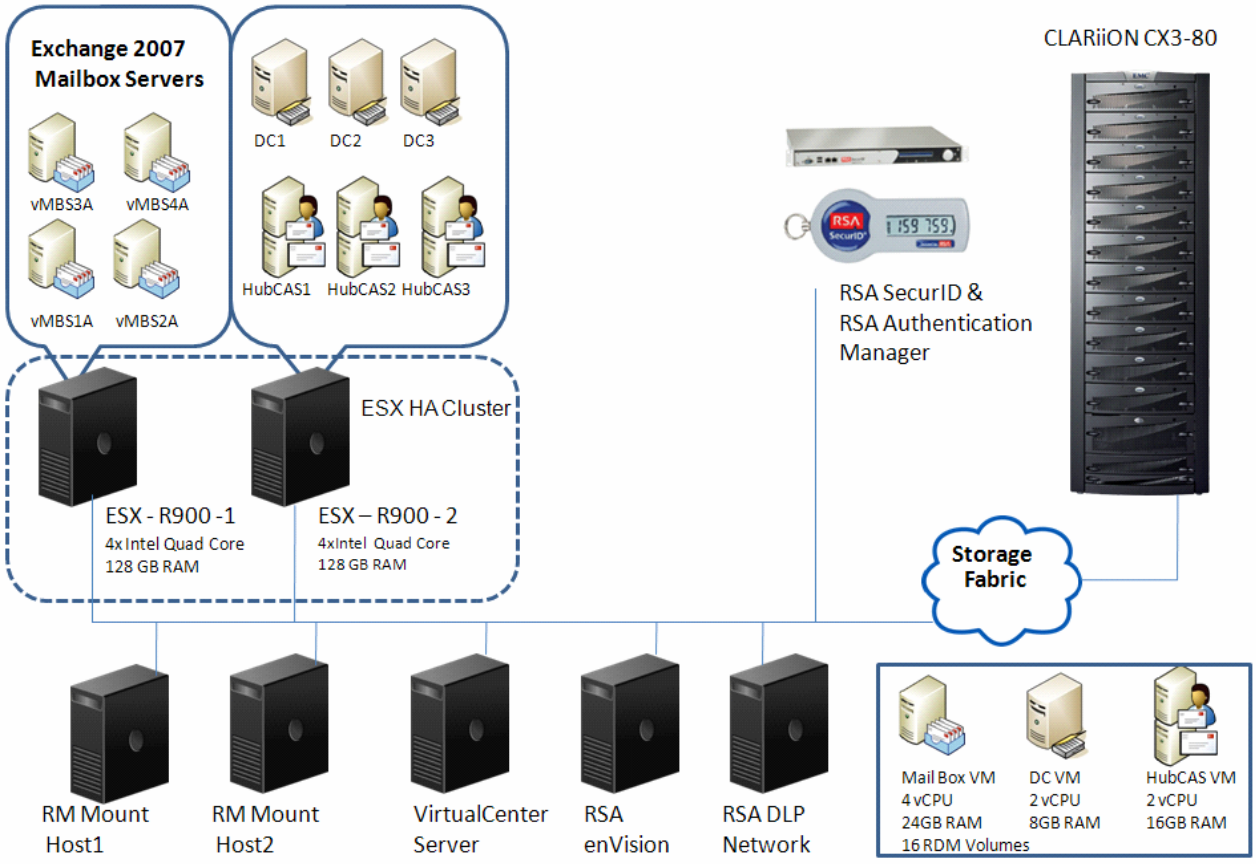

Figure 1. The EMC Scalable and Secure Architecture for Virtualizing Microsoft Exchange Proven Solution

Exchange 2007 configuration

Exchange 2007 SP1 Enterprise Edition was used in this solution. A detailed breakdown on the configuration of the servers and storage groups follows:

- Number of users: 16,000
- User Profile: Very Heavy (.48 IOPs) users
- Mailbox size: 350 MB mailbox limit with 15 days deleted item retention (DIR)
- Number of Mailbox Server virtual machines: Four with 4,000 users per virtual machine
- Number of ESG per Mailbox server: 8, with a total of 16 LUNs – 8 for logs and 8 for DBs

- Database LUN size: 250 GB (500 users * 350 MB = 175 GB) plus 35% (White Space, DIR)
- Log LUN size: 30 GB, four-day retention
- Total production space: 8 TB for DBs, 960 GB for logs
- Hub/CAS server configuration: Three Hub/CAS virtual machines (2 CPUs, 12 GB memory) and three domain controllers (2 CPUs, 8 GB memory), all on one ESX server in a VMware HA configuration with the Mailbox Server virtual machines.

Dell ESX server configuration

A new Dell Server was used to host the 16,000 Exchange users:

- Memory: 128 GB
- Server Type: Dell PowerEdge R900
- CPUs: 4 Quad-Core Intel Xeon 7350
- HBAs: 2 QLogic QLE2462
- Network Connections: eight 1 GB connections

CLARiiON configuration

A CLARiiON CX3-80 was used in the testing. A Cisco MDS 9509 was used as the SAN switch. For additional details on the CLARiiON configuration, see the following:

- Array type: CX3-80, FLARE Rel. 26
- Exchange production spindles: 64 300 GB FC 15k spindles for DB and 22 146 GB FC 15k for logs
- Guest OS spindles: 10 300 GB FC 10k
- Replication Manager clone spindles: 48 300 GB 10k drives
- Additional array software used: SnapView™ Rel. 26 (for clone creation)

VMware configuration

The VMware Infrastructure platform simplifies IT environments so that you can leverage your storage, network, and computing resources to control costs and respond quickly to changing business needs. The VMware Virtualization approach to IT management creates virtual services out of the physical infrastructure, enabling administrators to allocate these virtual resources quickly to the business units that need them most.

The VMware Infrastructure platform is the next generation of industry-leading infrastructure virtualization software. VMware Infrastructure 3 virtualizes servers, storage, and networking, allowing multiple unmodified operating systems and their applications to run independently in virtual machines while sharing physical resources and guaranteeing that business-critical services get the resources they need.

The Exchange Mailbox virtual machine configuration details are as follows:

- Number of virtual machines used to support 16,000 mailboxes: Four
- Number of VMware ESX servers to support the four Mailbox server virtual machines: One
- Mailbox VMware ESX server details: Dell R900, four quad cores, 128 GB memory, two QLogic QLE2462 HBAs
- Mailbox server virtual machine configuration: four vCPUs, 24 GB memory (supports 4,000 Very Heavy users)
- OS Swap space: 20 GB

Replication Manager configuration

In any Exchange design, backup and restore are critical components. Replication Manager and its Exchange 2007 agent were used to make VSS clone replicas of the Exchange storage groups. The RM Exchange replicas are created in seconds with no impact on production. The restore of an individual storage group takes about two minutes—regardless of the size of the database—due to CLARiiON's protected restore technology. The replicas were mounted onto a separate mount host and an integrity check was run against the Exchange data. The data can then be sent off to a tape if required. Further details on the configuration are as follows:

- Replication Manager version: 5.1.1
- Number of RM application sets per server: Two
- Number of mount hosts: Two
- Backup window: 12 hours
- Total number of RM jobs: Eight – two per Exchange Server
- Number of ESGs per RM job: Four
- Approximate amount of Exchange data per job\server: 700 GB (4 ESGs)
- Total number of disks required for clones: 48 300 GB FC 10k drives

Any successful Replication Manager implementation for Exchange relies on proper planning and scheduling based on requirements. See Table 1 for details around the Replication Manager jobs and the Exchange online maintenance (OLM) schedule that was used. It is recommended to avoid having an RM job running at the same time that Exchange OLM is running against an ESG.

Table 1. RM jobs and Exchange online maintenance

RM job and OLM information				
Server and SG	**Mount host**	**Order**	**RM job start**	**OLM**
VMBS1 SG1-4	MH1	1	7:00 P.M.	11 P.M.-3 A.M.
VMBS3 SG1-4	MH2	2	8:30 P.M.	12 A.M.-4 A.M.
VMBS2 SG1-4	MH1	3	10:00 P.M.	1 A.M.-5 A.M.
VMBS4 SG1-4	MH2	4	11:30 P.M.	2 A.M.-6 A.M.
VMBS1 SG5-8	MH1	5	1:00 A.M.	7 P.M.-11 P.M.
VMBS3 SG5-8	MH2	6	2:30 A.M.	8 P.M.-12 A.M.
VMBS2 SG5-8	MH1	7	4:00 A.M.	9 P.M.-1 A.M.
VMBS4 SG5-8	MH2	8	5:30 A.M.	10 P.M.-2 A.M.

Solution building block

To make this solution as scalable and useful to as many implementations as possible, a concept was used that for the purposes of this document is referred to as the *Exchange 2007/VMware building block*. The building-block approach defines the amount of resources required to support a certain number of Exchange 2007 users. The building block tested and documented here is based on 4,000 Very Heavy Exchange 2007 users with 350 MB mailboxes. Each of the 4,000 users occupied a single Exchange 2007 Mailbox server virtual machine and was divided among eight Exchange storage groups. Local HA was provided by

VMware HA and a second Dell R900. Each Mailbox server's Exchange data was backed up using two Replication Manager jobs. Each job contained four ESGs.

The major resources that are defined for the building block include the VMware client (see Table 2) as well as the CLARiiON spindle breakdown (see Table 3). While this exact building block may not be appropriate for all environments, the concept should be helpful as a starting point for most medium-to-large implementations looking to consolidate their Exchange users. Each virtual machine building block had CPU and memory sized based on Microsoft recommendations[1]. Table 2 illustrates how the 4,000-user building block was constructed and tested.

Table 2. Exchange 2007/VMware building block

Parameter	Value
Number of mailboxes supported	4,000
Virtual machine OS	Windows 2003 x64 R2 SP2
Virtual machine memory	24 GB
Virtual machine CPU	4 vCPU
Mailbox I/O profile	0.48 (Very Heavy)[2]
Mailbox size limit	350 MB
Server under test	Dell R900, 16 core/128 GB RAM
CPU type on test system	Intel Xeon 7350

Table 3 illustrates how the CLARiiON storage was configured as the design scaled out from one building block supporting 4,000 users, all the way up to four building blocks supporting 16,000 users. Table 3 also includes the required disks to support one local Replication Manager clone of the production Exchange data. The Exchange database and log LUNs were placed on separate RAID groups for best performance. The production database disks increased by a factor of 16 per building block, while the log incremented unevenly based on the RAID group configuration.

Table 3. CLARiiON storage building blocks

# of virtual machine building blocks	Number of users	Production disks	Backup clone disks
1	4,000	22 disks (16 DB 6 log)	12 disks
2	8,000	44 disks (32 DB 12 log)	24 disks
3	12,000	64 disks (48 DB 16 log)	36 disks
4	16,000	86 disks (64 DB 22 Log)	48 disks

1 http://technet.microsoft.com/en-us/library/bb738142.aspx

2 http://technet.microsoft.com/en-us/library/bb738147(EXCHG.80).aspx

JetStress storage building-block validation

Microsoft JetStress was used to validate the storage subsystem's capability to handle the I/O per second (IOPS) load. Jetstress version 08.01.0177.000 was used to simulate an I/O profile of 0.48 IOPS per user. See Table 4 for a breakdown of the JetStress results. The building blocks were validated using the same testing methodology required for the Exchange Solution Reviewed Program (http://technet.microsoft.com/en-us/exchange/bb412164.aspx): a two-hour performance test and 24-hour performance test. Each test is designed to validate the subsystem using different methods, with a two-hour burst test and a 24-hour test designed to show any issues a subsystem could have over a long period of time. JetStress testing passed both the performance and stress tests.

Table 4 shows the breakdown of the JetStress results.

Table 4. JetStress results

Parameter	Value
Average of the database disks read latency (ms)	16 ms
Average of the database disks write latency (ms)	4 ms
Average of the log disks write latency (ms)	1 ms
Average database disk read I/O per second	127 Reads/Sec
Average database disk write I/O per second	114 Writes/Sec
Average log disk write I/O per second	65 Writes/Sec
Max database page fault stalls per second	0

Performance validation of the virtualized Exchange environment

Microsoft LoadGen was used to do the end-to-end performance testing of all aspects of the solution. It was used to determine the configuration's ability to home 16,000 users with the Very Heavy Outlook user profile (.48 IOPS) on a single ESX server. LoadGen is a utility used to simulate the impact of MAPI, OWA IMAP, POP, and SMTP clients on the Exchange servers. These simulations test:

- Exchange Mailbox servers' ability to home the mailboxes.
- Hub Transport servers' ability to send and receive e-mail.
- CAS capability to accept the total number of clients' connections for the configuration.
- DC/GC ability to handle the global catalog lookups during the test run.
- RM's ability to backup and restore Exchange data being changed at a Very Heavy rate.

During these tests Microsoft, EMC storage, and VMware performance data was logged for analysis. This data presents an account of how the Microsoft Exchange Mailbox servers, Hub/CAS servers, and domain controllers within each VMware guest performed. The LoadGen Very Heavy profile produced I/O spikes of .48 IOPs and a total of around 288,000 logs during the ten-hour test run. In an effort to stress the environment as much as possible, the LoadGen test was run in online mode. The LoadGen profile executed 178 tasks per user during an 8-hour user day activity period, for a total of 2.85 million tasks. For the full test duration of 10 hours, over 3.4 million tasks were executed. See Table 5 for details.

Table 5. LoadGen test details

Name	Succeeded	Client Type	Action Profile	User Count	Tasks per User Day	TasksCompleted
vMBS1A	Succeeded	Outlook 2007 Online	VeryHeavy	4000	178	893698
vMBS2A	Succeeded	Outlook 2007 Online	VeryHeavy	4000	178	861215
vMBS3A	Succeeded	Outlook 2007 Online	VeryHeavy	4000	178	854603
vMBS4A	Succeeded	Outlook 2007 Online	VeryHeavy	4000	178	834226

It is important that the Exchange Mailbox server, the DC/GCs, and Hub/CAS servers within the virtual machines all perform well during these tests. It is also important that the VMware ESX server is not overcommitted and that the storage array is performing well. These dependency servers must also perform to high standards to ensure a very good overall user experience.

The LoadGen tests reported latencies for all tasks across the mailbox virtual machines and maintained equal performance across all four building blocks. No single server over- or under-performed the other. This shows VMware ESX's capability to handle the high I/O for all servers and shows that all the servers were properly sized for the user count and I/O.

Perfmon and esxtop showed the Exchange server's processors were not over- or under-committed. In the physical world, Exchange servers often have more processing power and/or RAM than is required. The servers remained at a steady state, never becoming processor-bound or constantly idle. Hub/CAS % processor utilization remained between 10-20 percent, and DC/GC % processor time remained around 2 percent, showing that virtualizing the infrastructure servers for Exchange is not only possible but will run with very good performance.

Figure 2 represents the CPU utilization on the ESX server with the four mailbox virtual machines on it during the daytime hours of the 24-hour test. During this test, LoadGen ran at a Very Heavy load for the first 10 hours, then OLM and RM ran and completed for all ESGs. As can be seen, the CPU utilization on the ESX servers averaged around 40 percent. Note the ESX server configuration was able to handle the large spikes at the beginning of the test before the Mailbox server's memory had been filled.

Figure 2. CPU utilization on the ESX server with four mailbox virtual machines

While running LoadGen it is important to monitor performance of not only the Exchange servers, but the Hub/CAS servers and DC/GCs as well. The Mailbox servers should be monitored to ensure that the processors are not overwhelmed and that the RPC latencies and RPC requests remain below Microsoft recommended levels. Exceeding the levels indicates there is a bottleneck within memory, processor, disk, or the network

RPC average latency

The average RPC latency during the LoadGen run for all Exchange servers remained around 5ms—well within Microsoft recommendations. The RPC Averaged Latency counter signifies the amount of time taken to handle Outlook RPC Requests (tasks such as Sending Mail, Browsing the Calendar, and so forth). During normal high operations the VMware Guest with Exchange 2007 is capable of handling the high I/O load, and during spikes continues to quickly handle those loads.

RPC requests

RPC requests remained below 25 per second and averaged around 5 per second. During a peak load, the RPC requests did not reach above 25 per second. The RPC Requests counter signifies the number of RPC requests being handled by the system. Outlook MAPI clients use RPC to communicate with the Exchange server. If this counter reaches higher numbers, it will directly impact the Outlook users. The most common reasons for this counter rising are network, CPU, disk or memory bottlenecks. In this testing, the systems were able to handle all requests throughout the entire run.

CX3-80 storage performance

The array performance is the other crucial component in the solution. Figure 3 is an image from CLARiiON Navisphere Analyzer, which shows the I/O/second that the array was handling during the 24-hour test run. Notice that from the array perspective the busiest time is not during the day but rather at night when Exchange OLM is running and the RM clones are being synchronized and checked by ESEUTIL. This highlights that while JetStress is a valuable test to run, testing with LoadGen can better replicate all aspects of a daily lifecycle of Exchange. The array was able to comfortably handle 7,300 IOPs per SP, with total peaks of 14,710 I/O/second.

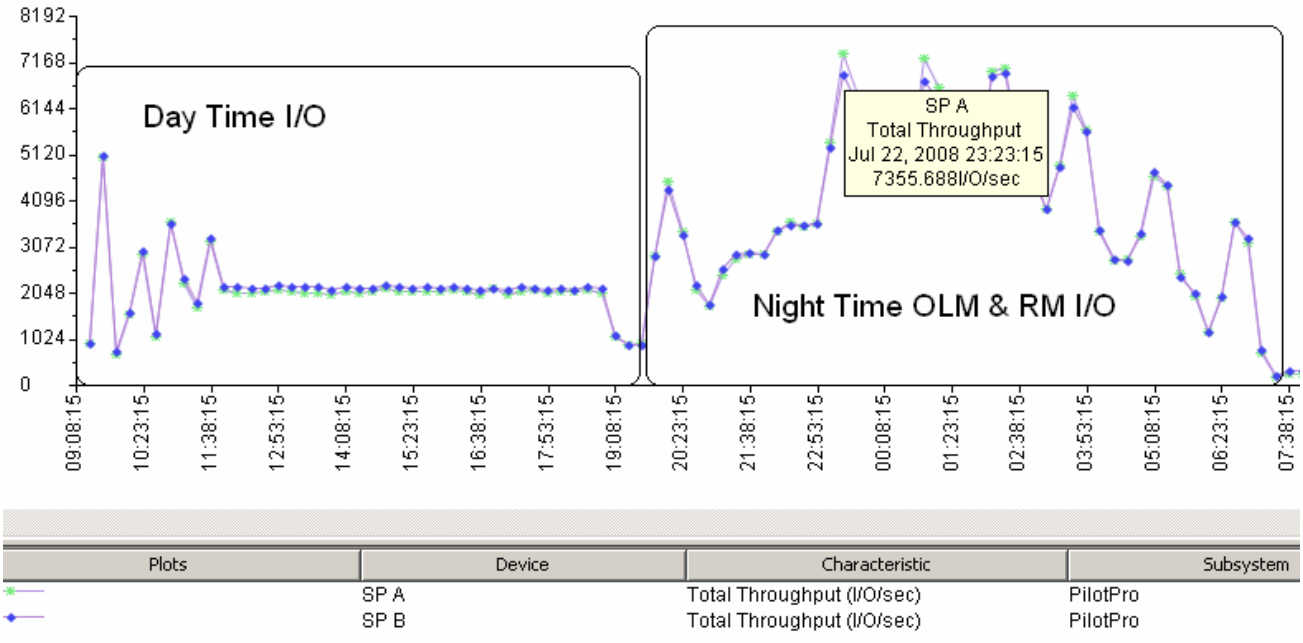

Figure 3. CX3-80 I/O/second total items delivered

Exchange HUB/CAS performance

Figure 4 shows the total items delivered. The three Exchange HUB/CAS servers were all on a single ESX server. On average they each handled five messages per second. In this testing, the VMware guest Hub/CAS servers delivered over 1.3 million messages during a normal workday.

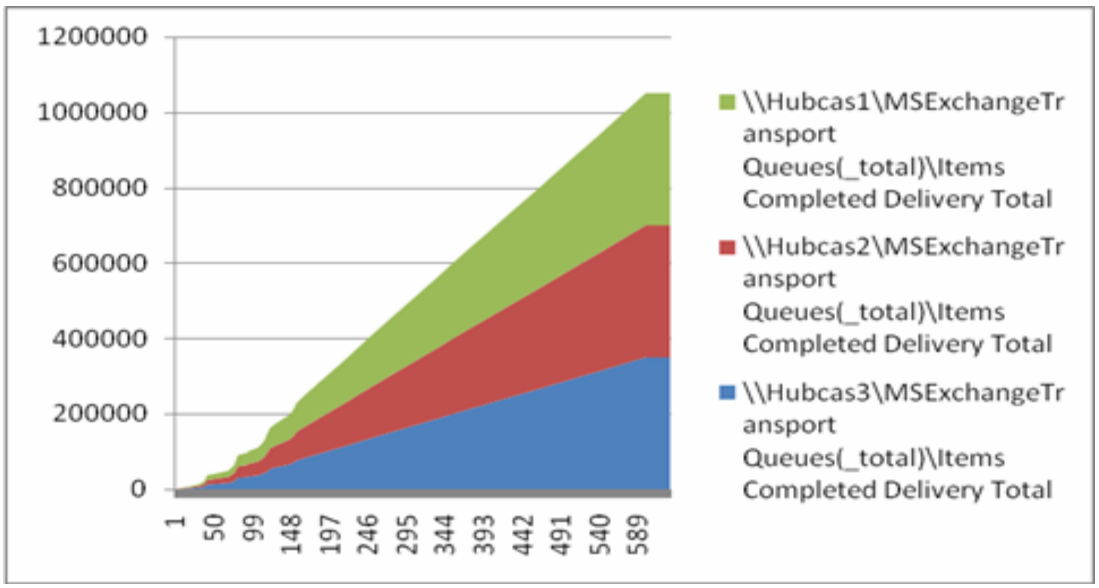

Figure 4. Total items delivered

The VMware guest Hub/CAS servers were capable of handling the load during the entire LoadGen run. The queues remained low throughout the test and recovered quickly during high mail flow periods.

Replication Manager performance

The key to a successful RM job performance is to evenly distribute the load and avoid contention as much as possible. The local RM job test ran successfully and completed within the backup window. See Table 6 for a breakdown on how the RM jobs performed during testing.

Table 6. RM job performance

Task	Average time to complete
Clone resynchronization	44 minutes
Mount\unmount replicas	3 minutes
Eseutil integrity check	51 minutes (approximately 700 GB)
Total time for job to complete	1 hour 45 minutes

VMware HA performance

With any critical application like Exchange, there must be a mechanism for the application to quickly recover from the hardware failure. MSCS was traditionally used as the most common local failover approach for Exchange, but with VMware HA capabilities a different option is now available. VMware HA or VMHA allows VirtualCenter to automatically migrate and restart virtual machines when a host fails. Within this solution, two Dell R900 servers were placed in a VMHA cluster. Both servers were configured the same—the first server had all the Exchange mailbox virtual machines, and the second server had the HUB\CAS and DC servers (as shown in Figure 1). During the testing, the ESX server hosting the mailbox server virtual machines was powered off. It took 5-7 minutes for Exchange to come on line on the second R900 and to begin servicing clients. This testing was performed under a heavy LoadGen load. Note that with VMHA, when the primary ESX server fails, a restart of the virtual machine and Exchange is required.

There are a number of possible ways to distribute the Exchange virtual machines and DCs. One option is to evenly distribute the mailbox, HUB/CAS, and DC servers between the ESX servers in the cluster. However, for the purpose of validating how all 16,000 users on a single server would perform, this was not done.

Security

The EMC Secure Virtual Exchange solution integrates industry-leading RSA security technology throughout the architecture, which builds four comprehensive elements of security into the EMC Secure Exchange Virtual solution:

- Policy management
- Data discovery and classification
- Data control with access management and encryption and data leakage prevention
- Log and audit management

RSA SecurID® Authenticators and RSA® Authentication Manager provide strong authentication of users accessing e-mail, performing remote administration, and connecting to network resources remotely. RSA Authentication Manager support for Microsoft Windows Server, Terminal Services and Internet Information Server (IIS), and Outlook Web Access (OWA) provides strong two-factor authentication across multiple solution layers. Proven integration with Cisco network devices (VPN, firewall, routers and switches) provides even greater access control capabilities for secure remote access and management.

The RSA Data Loss Prevention (DLP) Suite provides unified, seamless data policy orchestration across the EMC Secure Virtual Exchange solution, allowing customers to discover and monitor sensitive data and apply the appropriate enforcement mechanisms to secure sensitive data across the solution stack. The

integrated RSA DLP Suite enables organizations to continuously monitor all incoming and outgoing e-mail messaging communications to help ensure that no data transfers take place that violate policy.

In addition, the RSA DLP Suite is engineered into the EMC solution both to regularly scan the environment to detect content that is out of compliance with defined policies and to notify administrators or take action—such as quarantining sensitive data—depending upon the rules established by the organization.

The EMC Secure Virtual Exchange solution offers strong compliance capabilities with the inclusion of RSA enVision® technology, a market-leading log management solution for simplifying compliance, enhancing security operations and optimizing IT and network operations. The RSA enVision platform provides the capabilities necessary to:

- Monitor solution components.
- Correlate events.
- Monitor network components for security incidents and events.
- Manage and protect event logs.
- Detect security events.
- Alert administrators when policy requires.

With these security capabilities, the EMC Secure Virtual Exchange solution offers one of the most robust Exchange offerings to manage your corporate information risk, information governance policies, and compliance requirements.

Conclusion

This proven solution's results validated the approach to virtualizing all Exchange 2007 server roles with VMware ESX Server and EMC CLARiiON storage. VMware ESX Server 3.5 was used to host the Exchange Server virtual machines, and EMC CLARiiON CX3-80 was used to host the Exchange database and log storage. EMC Replication Manager software was used for local backup and restore. Additionally, the proven solution was secured by industry-leading RSA security technology throughout the architecture.

The Exchange 2007/VMware building block that was tested was based on 4,000 Very Heavy Exchange users with 350 MB mailboxes, and scaled out to four building blocks, supporting 16,000 users on a single Dell R900 server. The results of the testing validate the performance and scalability of a VMware Exchange server deployment. The test results demonstrate how Exchange 2007 can be consolidated when virtualized to break through the eight cores and 32 GB memory limitations that Exchange 2007 is subject to in a physical server deployment that does not leverage VMware ESX Server.

The local Replication Manager backup test ran successfully and completed within the backup window.

The performance results of the testing illustrate that a customer considering an Exchange 2007 deployment will benefit greatly by employing a virtualized platform with VMware and EMC CLARiiON storage. For instance:

- **Reduced costs:** This solution resulted in the consolidation of servers: from 10 down to 2. By consolidating Exchange servers into virtual machines running on powerful 64-bit server hardware, companies will lower the costs associated with their Exchange server infrastructure. The cost savings are numerous: server hardware and maintenance costs, reduced rack and floor space, reduced data center power and cooling costs, and reduced infrastructure costs (host bus adapters, cables, switch ports), just to name a few.
- **Increased flexibility:** Virtualized Exchange servers are no longer tied to a physical server and can be dynamically load balanced across VMware ESX servers. The 4,000 Very Heavy Exchange user building block proved to be well suited to a dynamically load-balanced virtual environment.
- **Simplified Mailbox server design:** Using a building-block approach like the one used and validated in this solution, Exchange environments can be deployed using a modular approach resulting in predictable performance for all Mailbox servers. The building-block approach takes the guesswork out of sizing Mailbox servers and associated storage.

- **Risk mitigation and increased design flexibility:** Splitting the Exchange user population into multiple virtual machines can reduce risks associated with a single Mailbox server outage, as each building block is limited to 4,000 users. This modular approach also allows the Mailbox server design to meet different business and technical requirements for different groups of users, without requiring additional server hardware. For example, each Mailbox server virtual machine can be designed with its own unique backup solution, disaster recovery solution, high-availability solution, compliance requirements or any other design elements.
- **Unprecedented server scalability and ROI:** The server tested in this solution was a Dell R900 with 16 processor cores and 128 GB RAM. Running multiple virtual machines on these servers allows the full value to be unlocked from this hardware and provides scalability that far exceeds unvirtualized configurations.

Using EMC's work with VMware on this solution—which illustrates the many benefits of a virtualization-enabled platform for Exchange 2007 using the building-block approach—customers can begin to design and implement an Exchange 2007 virtualized environment.

References

The following is a list of support documents and links to documents that provide further information about virtualizing an Exchange 2007 environment:

The VMware webpage for Exchange virtualization includes the following technical documentation:

- *SAN System Design and Deployment Guide*
- *Performance Tuning Best Practices for ESX Server 3*
- *CLARiiON Integration with VMware ESX Server*
- *VMware Certified Compatibility Guides*

Also refer to the following Microsoft Support Policies article:

- *Support for Microsoft Software in VMware Virtual Machines*