



Cisco Unified Computing System and EMC VNXe3300 Unified Storage System

An Ideal Solution for SMB Server Consolidation

White Paper

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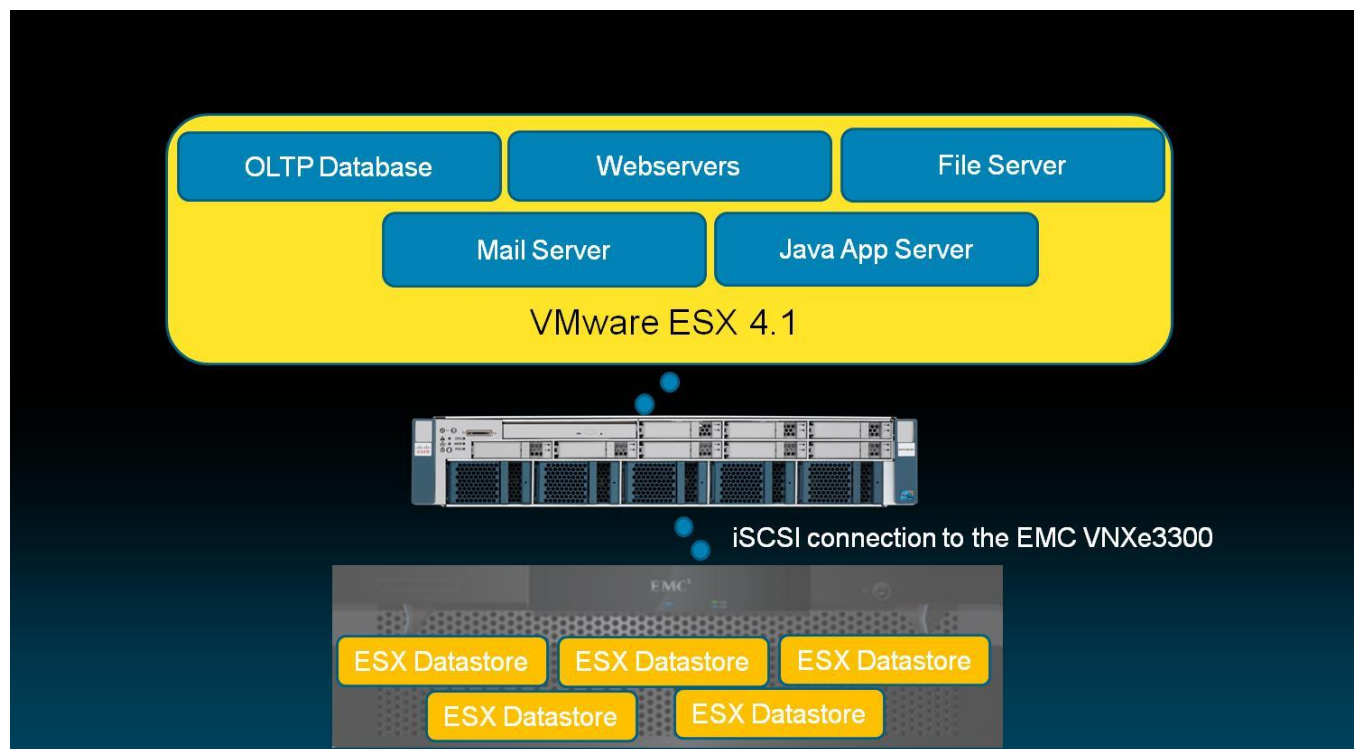
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Cisco UCS C250 M2 Extended-Memory Rack-Mount Server with EMC[®] VNXe3300[™] is an Ideal Solution for SMB Application Server Consolidation

A small or medium business can run its critical business applications on the powerful Cisco UCS C250 M2 server connected to the low-cost, easy to configure EMC VNXe3300 storage solution. In this paper we demonstrate how critical web server, database, mail server, file server and Java application server workloads can be consolidated onto a single Cisco UCS C250 M2 server using VMware ESX 4.1, with the EMC VNXe3300 providing high-performance iSCSI-based storage for the ESX VMFS datastores.

Figure 1 Cisco UCS C250 M2 Server with EMC VNXe3300 Configuration



Cisco UCS C250 M2 Extended-Memory Rack-Mount Server

The Cisco UCS C250 M2 Extended-Memory Rack-Mount Server (Figure 2) is a high-performance, memory-intensive, two-socket, two-rack-unit (2RU) rack-mount server designed to increase performance and capacity for demanding virtualization and large-data-set workloads. It also reduces the cost of smaller memory footprints through the use of lower-cost, lower-density memory modules. The system is ideal for virtualized workloads in enterprise data centers, service provider environments, and virtual desktop hosting environments. The system also helps increase performance for large-data-set workloads, such as database management systems and modeling and simulation applications.

Figure 2 Cisco UCS C250 M2 Server



The following are the key features of the Cisco UCS C250 M2 Rack-Mount Server:

- Up to two six-core Intel Xeon 5600 series processors; these multicore processors automatically and intelligently adjust server performance according to application needs, increasing performance when needed and achieving substantial energy savings when not
- Up to 384 GB, 48 dual in-line memory module (DIMM) slots, based on Samsung 40 nm class DDR3 memory technology twice as much as similar servers in the industry
- Up to eight internal SFF SAS or SATA drives for a total of up to 4.8 TB
- RAID 0 and 1 support for up to eight SAS or SATA drives with the optional LSI SAS30813E-R PCIe RAID Controller; and RAID 0, 1, 5, 6, 50, and 60 support for up to eight SAS or SATA drives with the optional LSI MegaRAID Controller
- Support for up to five PCIe cards in three low-profile, half-length x8 and two full-height, half-length x16 slots; all slots use x16 connectors
- Four integrated Gigabit Ethernet ports and two 10/100-Mbps Ethernet management ports for accessing the Cisco UCS Integrated Management Controller
- Front-panel CD/DVD drive, locator LED, and interface with video, two USB, and serial port connections
- Back-panel video, two USB, and serial port connectors
- Increased reliability, availability, and serviceability through optional dual-redundant power supplies meeting Climate Saver specifications and front panel-accessible hot-swap cooling fans

EMC VNXe3300 Unified Storage System

The EMC VNXe series are ideal storage platforms for SMB's and SME's making the move to server virtualization to drive consolidation and greater efficiency. Members of the VNXe family support unified IP storage operation enabling a single system to simultaneously serve file-oriented (NFS and CIFS) and block-oriented (iSCSI) applications. The VNXe3300 system supports a full complement of enterprise-class storage features and can be easily expanded - but it is still a simple-to-use and very affordable system.

The VNXe series include a powerful management system, Unisphere™, which sets a new standard for ease-of-use. Designed with the needs of the IT generalist in mind, Unisphere delivers a powerful graphical user interface that incorporates application-aware management concepts to assist administrators who are not storage experts. Configuration and provisioning wizards are built-in to assist the non-technical user in initial setup and deployment.

The VNXe3300 system is based on a redundant and highly-reliable architecture with no single-point-of-failure. The dual controller architecture includes mirrored cache and back-up to flash memory avoiding time-limited battery backup or the need for external power supplies. A basic VNXe3300 system can start with a compact, three-rack-unit (3RU) base unit supporting up to 15 disk drives, and the system can be easily expanded by adding up to seven additional 15-drive expansion enclosures.

Key features of the EMC VNXe3300 include:

- Unified storage system consolidates SAN (iSCSI) and NAS (NFS, CIFS) application traffic using a single cost-effective, easy-to-manage and highly-available platform.
- Powerful storage management through Unisphere™, a graphical, task-oriented GUI that enables system configuration, storage provisioning, system monitoring, alerts, and troubleshooting.
- Application-aware storage system with built-in configuration and provisioning support for VMware ESX/ESXi, Microsoft Hyper-V, Microsoft Exchange, and shared folders (NFS, CIFS).
- Available data management features include snapshots, thin provisioning, file de-duplication with compression, and local/remote replication.

- Integrated VNXe ecosystem allows easy access to product information including product documentation, training, help and how-to-videos, troubleshooting, software downloads, and an online knowledge database.
- Compact 3RU base unit with dual active storage controllers based on quad-core Intel Westmere Xeon processors. Each controller includes 12GB of memory and includes mirrored cache.
- 6Gbps serial attached SCSI (SAS) is utilized to interconnect drives and expansion enclosures delivering high performance while simplifying capacity expansion.
- VNXe3300 consists of a base unit and up to seven expansion drive enclosures, each supporting up to 15 Large Form Factor (LFF) 3.5" disk drives, for a maximum of 120 disk drives or 240TB of total (raw) storage capacity.
- Supported drive types include 300GB and 600GB high performance SAS drives (15K rpm) and 2TB high capacity Near-line SAS drives (7.2K rpm).
- Base unit comes standard with eight 1Gbps Ethernet ports and can be expanded with up to four additional FlexI/O modules (two modules per controller). FlexI/O modules are available with either four 1Gbps Ethernet ports or two 10Gbps optical Ethernet ports.

Figure 3 EMC VNXe3300-Front View



Figure 4 EMC VNXe3300-Back View



The SMB Application Server Consolidation Solution Demonstration

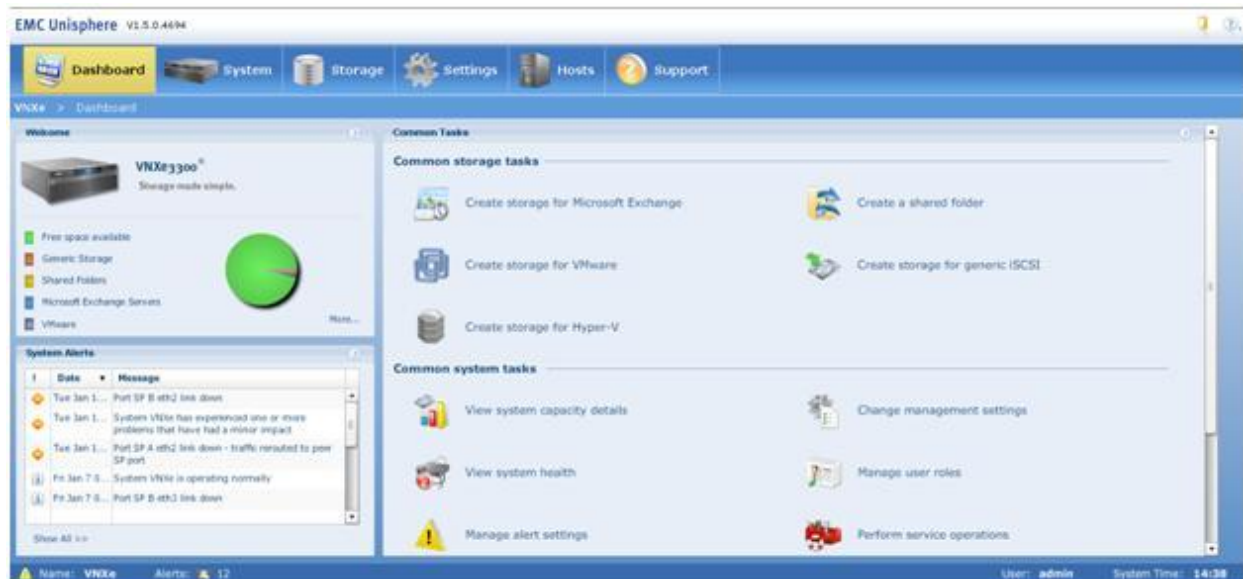
To simulate the solution running common applications found in an SMB, a set of representative benchmarking tools were used (Table 1). There is an e-commerce solution representing a 2-tier OLTP solution where internet users connect to Apache web servers, which in turn perform transactions on a MySQL database. In this particular example, there are 3 web server front ends that connect to a single database, representing a scalable solution. The workload for the e-commerce solution was provided by a well-known DVD Store benchmark. The mail server simulation is a Microsoft Exchange 2007 application running on Windows 2008 Server R2 Enterprise Edition. The simulation uses the LoadGen tool to simulate 1000 users. The file server simulation uses 50 threads constantly doing file operations using the dbench tool to generate the workload. The Java server simulation uses Windows 2008 Server R2 Enterprise Edition running a modified (and non-comparable) version of the SPECjbb2005 workload.

The Cisco UCS C250 M2 server used for the solution was configured with (2) Intel Xeon X5670 processors and 196GB RAM. The EMC VNXe3300 was configured with 4x1Gb iSCSI connections and housed (45) 600GB SAS disks.

Table 1. Virtual Machine Configuration

Workload	Operating system	Virtual Processors	Configured Memory	Configured Storage
Mail Server	Windows 2008 Server R2 Enterprise Edition	4	8GB	72GB
File Server	SUSE Linux Enterprise 10 (32-bit)	1	256MB	8GB
Java Server	Windows 2008 Server R2 Enterprise Edition	4	8GB	30GB
Database Server	SUSE Linux 11 (64-bit)	4	4GB	45GB
Web Servers (3)	SUSE Linux 11 (64-bit)	2 (ea)	2GB (ea)	10GB (ea)

Figure 5 Configuring LUNs with the EMC VNXe3300



EMC VNXe has application integration with VMware ESX, Hyper-V and Microsoft Exchange, making configuration fast and easy.

Figure 6 Configuring a VMware ESX datastore using EMC VNXe3300



Running the Simulation Shows the EMC VNXe3300-Cisco UCS C250 M2 Solution Provides Ample Room to Grow

The simulation workload ran at a throttled rate of:

- 1000 email users on Microsoft Exchange 2007 on Windows Server 2008 R2 Enterprise Edition
- 50 threads doing random fileserver traffic on SUSE Enterprise Linux 10
- 98831 Java operations/second
- 8800 Web orders per minute using apache web servers and a MySQL OLTP database on SUSE Enterprise Linux 11

The Cisco UCS C250 M2 and EMC VNXe3300 resource usage was measured using the esxtop utility that comes with VMware ESX 4.1. Esxtop showed that the system was untaxed, showing only 30% CPU utilization and optimal average disk response times of 4ms.

Average CPU Utilization	30%
Average Memory Utilization	20 GB
Average iSCSI Response Time	4 ms
GB Storage Used	165 GB

Encouraged by the amount of remaining resources, the virtual machines were cloned and the simulation was run with twice the workload: (2) Microsoft Exchange mail servers, (2) file servers, (2) MySQL OLTP databases, (2) Java servers and (6) web servers. Using esxtop to measure system resources during this test shows CPU utilization on the UCS C250 M2 at 65% and iSCSI response time from the VNXe3300 is still a very respectable 6ms.

Average CPU Utilization	65%
Average Memory Utilization	40 GB
Average iSCSI Response Time	6 ms
GB Storage Used	330 GB

Conclusion

In this white paper we demonstrate how a simple solution consisting of a single Cisco UCS C250 M2 Extended-Memory Rack-Mount Server running VMware ESX 4.1 connected to EMC VNXe3300 can consolidate numerous critical SMB applications. These applications include but are not limited to Apache web servers, Microsoft Exchange mail servers, MySQL databases, file servers, and Java application servers. The outstanding compute power and memory capabilities of the Cisco UCS C250 M2 Extended-Memory Rack Mount Server mated with high-performance iSCSI-based storage from the EMC VNXe-3300, has the capability to support thousands of e-commerce order transactions per minute, serve thousands of web pages, and support thousands of mail users—all simultaneously, creating an ideal solution for small and medium businesses.



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