Cisco Leads Cloud Computing Performance with the Industry's First VMware vSphere 5.1 Benchmark Result

Powered by the Cisco UCS B200 M3 Blade Server

Performance Brief
September 2012

Highlights

Best in Performance
- The Cisco UCS® B200 M3 Blade Server delivers a VMware® VMmark™ 2.1 score of 42.79@36 tiles, an industry record.

Best in Scalability
- Cisco's VMmark 2.1 result doubles the number of servers compared to all previous results, demonstrating Cisco's exceptional scale-out performance

First VMware vSphere 5.1 Result
- The Cisco Unified Computing System™ (Cisco UCS) adapts automatically to support different workloads and demonstrates agility through the industry's first VMware VMmark benchmark result using vSphere 5.1 software.

Blade Server Without Compromise
- Cisco UCS is powered by the Intel® Xeon® processor E5 family, up to 768 GB of memory capacity, and built-in programmable I/O configuration.

Violin Flash Memory Arrays
- Flash memory enhances performance and economics to support virtualized and cloud environments and provides the reliability required for a strategic business resource. Cisco UCS interoperates with enterprise flash storage to increase the performance of virtualized applications.

Architecture That Increases Performance
- The radically simplified architecture directly connects virtual machines to the network fabric, increasing performance.

Cisco offers the best infrastructure for cloud computing available today. With its world-record-setting 8-node VMware VMmark 2.1 score of 42.79@36 tiles, Cisco UCS is best in performance and best in scalability, and the result is the first to incorporate VMware vSphere 5.1—all critical contributors to effective cloud computing environments.

Since the Cisco Unified Computing System™ (Cisco UCS®) was introduced three years ago, it has captured more a dozen world-record performance titles on VMware® VMmark™ benchmarks. The Cisco UCS B200 M3 Blade Server's score of 42.79@36 tiles on the VMware VMmark 2.1 benchmark establishes many records for Cisco and for the industry. Cisco is best in performance, with a result more than double HP's best result of 18.27@18 tiles (Figure 1). Cisco is best in scalability, outperforming Fujitsu's result of 36.07@36 tiles by more than 18 percent. Cloud computing environments must be able to scale well horizontally so that adding more servers delivers a commensurate amount of performance and capacity. The results show that eight 2-socket Cisco UCS B200 M3 servers outperform four 4-socket Fujitsu servers, contradicting the conventional wisdom that vertical scaling outperforms horizontal scaling. Cisco is the first to publish VMmark benchmark results on VMware vSphere 5.1, demonstrating the speed at which Cisco UCS can adapt to support new environments and surpass the competition.

Architecture Increases Performance

Cisco UCS is a truly unified system whose configuration is completely automated through unified, model-based
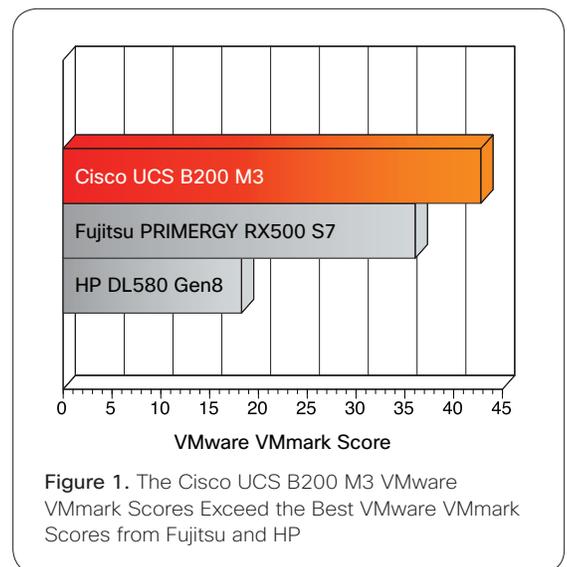

Figure 1. The Cisco UCS B200 M3 VMware VMmark Scores Exceed the Best VMware VMmark Scores from Fujitsu and HP

management to simplify deployment of enterprise-class applications and servers running in bare-metal, virtualized, and cloud computing environments. Supporting blade and rack servers in the same management domain, Cisco UCS delivers better performance at lower cost. The Cisco® fabric extender architecture connects the system's unified fabric directly to blade and rack servers and individual virtual machines. This connection increases network throughput and eliminates the need for the multiple switching, I/O, and management modules that clutter traditional blade systems and increase infrastructure costs.

Without redundant network switches, management modules, and cables blocking the rear of its blade-server chassis, Cisco UCS has an elegant, efficient, straight-through airflow and lower infrastructure power budget. This design leaves more room to power and cool some of the most powerful Intel® Xeon® processors available, further accelerating cloud computing performance.

VMware VMmark 2.1 Benchmark

The VMmark 2.1 benchmark tests virtualization performance and infrastructure performance and agility for cloud computing environments. Unlike traditional virtualization benchmarks, VMmark 2.1 includes tests that demonstrate how well a system's servers, network, and storage support virtual machine movement, storage migration, and virtual machine

Figure 2. Eight-Node VMware VMmark 2.1 Benchmark Configuration
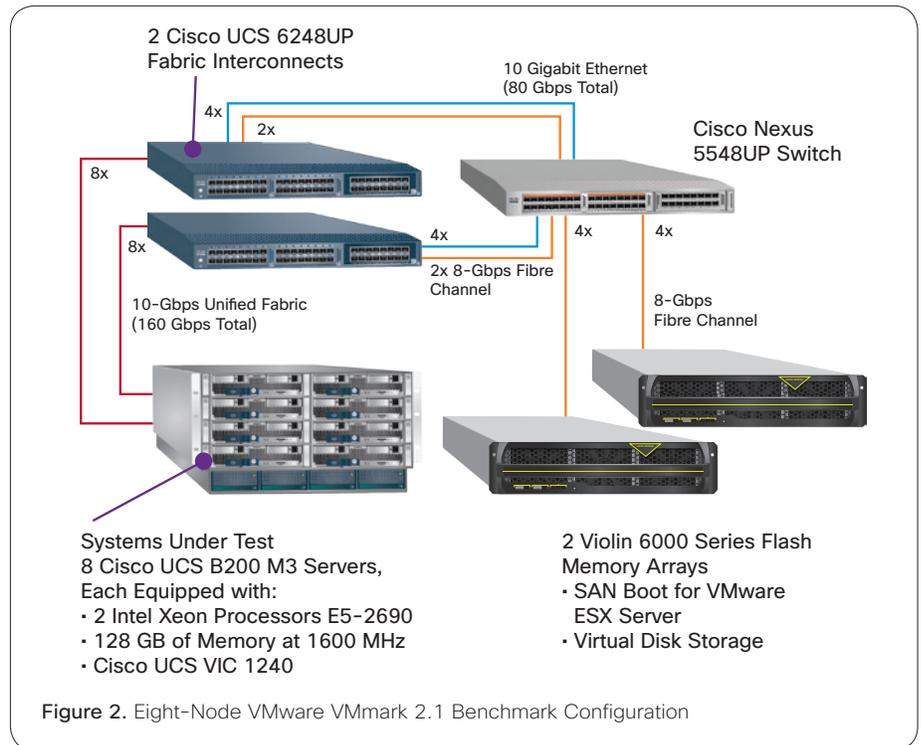
provisioning. The benchmark uses a tiled design that incorporates six real-world workloads to determine a virtualization score. Then it factors VMware vMotion, Storage vMotion, and virtual machine provisioning times to determine an infrastructure score. The combination of these scores is the total benchmark score.

Cisco UCS B200 M3 Blade Server Benchmark Results

Cisco achieved a VMmark 2.1 benchmark score of 42.79@36 tiles using eight Cisco UCS B200 M3 Blade Servers (Figure 2), each powered by two 8-core Intel Xeon E5-2690 processors. Intel Turbo Boost Technology was enabled to raise the

clock speed from 2.9 GHz to up to 3.8 GHz as conditions permit. Each system was configured with 128 GB of main memory and a built-in Cisco UCS Virtual Interface Card (VIC) 1240.

No-Compromise Blade Server

The Cisco UCS B200 M3 is a blade server without compromise. Powered by the Intel Xeon processor E5 family, the half-width blade server offers 24 DIMM slots (up to 768 GB with 32-GB DIMMs) to support large virtual machine footprints. The server is designed to deliver the utmost in I/O bandwidth and flexibility. It is the first blade server anywhere to provide built-in programmable I/O connectivity. This feature enables the number and type of I/O devices to be configured
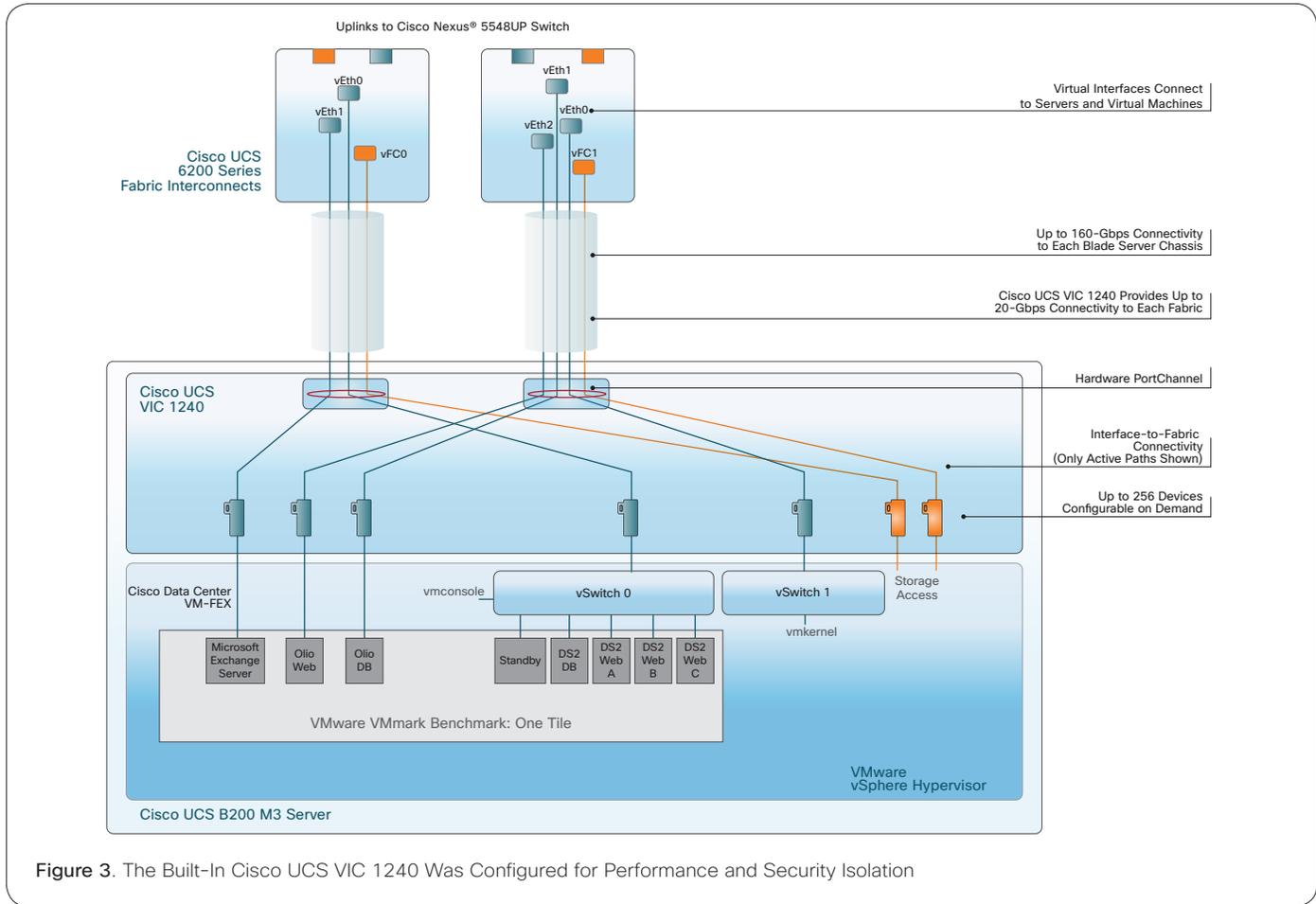
Figure 3. The Built-In Cisco UCS VIC 1240 Was Configured for Performance and Security Isolation

on demand to support the needs of both VMware vSphere and the virtual machines running on the server, helping optimize performance and security for cloud computing environments.

Cisco Virtual Interface Cards

The built-in Cisco UCS VIC 1240 is a modular LAN-on-motherboard (mLOM) I/O adapter that can be programmed on demand to match the needs of the hypervisor and the workload. The card can support up to 256 devices, in

any combination of Ethernet network interface cards (NICs) and Fibre Channel host bus adapters (HBAs). The adapter accesses each of the system's two network fabrics for 40 Gbps of I/O connectivity. The Cisco UCS B200 M3 server's single mezzanine slot can be configured with an additional I/O adapter or a port expander card for the Cisco UCS VIC 1240 to bring the VIC's I/O connectivity to up to 80 Gbps. The expander card was not installed for the VMware VMmark benchmark.

The benchmark did use the Cisco Data Center Virtual Machine Fabric Extender (VM-FEX), which connects NICs to individual virtual machines for greater network throughput. All network traffic is centrally managed by the system's fabric interconnects, eliminating software and blade server switching. Coordination between Cisco UCS Manager and VMware vSphere maintains the association between NICs and virtual machines regardless of physical location.

For the benchmark, the Cisco UCS VIC 1240 was configured with seven devices (Figure 3). Two Fibre Channel HBAs were used to provide redundant access for virtual machine images and for use in booting the VMware vSphere hypervisor. One Ethernet NIC was used to connect and securely isolate the vmkernel interface through vSwitch 1. The vmconsole, standby, and DVD Store Version 2 (DS2) virtual machines were supported by a NIC connected to vSwitch 0. Three dynamic Ethernet NICs were configured using Cisco Data Center VM-FEX to support virtual machines in each benchmark tile for:

- Microsoft Exchange Server
- Olio web servers and database instances

Segregating traffic from different applications helps enable better management of quality of service (QoS) and provides enhanced security for client applications in real-world situations.

Intel Xeon Processor E5 Family
The Cisco UCS B200 M3 server is powered by the Intel Xeon processor E5 family. This versatile processor family forms the core of a flexible and efficient data center. Designed to deliver the right combination of performance and built-in capabilities at lower cost, the Intel Xeon processor E5 family delivers adaptive performance to a wide range of applications. In addition, Intel integrated I/O dramatically reduces I/O latency to help eliminate data bottlenecks and increase agility. Almost any environment—from virtualization and cloud computing platforms to design automation systems and real-time financial transaction processing systems—can take advantage of the Intel Xeon processor E5 family to boost computing and storage performance and streamline data center operations.

Violin 6000 Flash Memory Array
The benchmark's boot images and virtual machine storage were placed on two Violin 6000 Series Flash Memory Arrays. These storage arrays are flash memory systems with the reliability, performance, and economics for deployment for mission-critical storage. A single system fits in three rack units (3RU) of space and can deliver up to one million I/O operations per second with 4 Gbps of bandwidth. The array is built with fully redundant components with no single point of failure, hot-swappable components, active-active Violin vRAID, spare memory to support a fail-in-place model, and systemwide wear leveling. Violin's flash-optimized vRAID stripes data across multiple memory modules for parallel access and nonblocking erase functions, to deliver consistent latency.

Conclusion

Best for performance. Best for scalability. First published vSphere 5.1 results. Cisco's continued leadership in cloud computing demonstrates the value of good infrastructure for cloud computing environments.

With innovations including dual 10-Gbps unified fabrics, the Intel Xeon processor E5 family, built-in Cisco VICs, Cisco Data Center VM-FEX, large memory capacity, and Violin's all-solid-state memory, Cisco's results demonstrate the architectural advantages of a system built for virtualized environments, and they provide customers with a measure of what they can expect when deploying the Cisco Unified Computing System.

For More Information

- For more information about the Cisco Unified Computing System, visit http://www.cisco.com/go/ucs.
- For more information about Violin flash memory systems, visit http://www.vmem.com.

Disclosure

VMware VMmark is a product of VMware, Inc. The comparative results cited in this document were available at http://www.vmmark.com and were valid as of September 11, 2012.