



RED HAT ENTERPRISE VIRTUALIZATION: SCALING THE LAMP WEB SERVER STACK

EXECUTIVE SUMMARY

The goal

Determine the scalability of the the LAMP (Linux, Apache webserver, MySQL database, PHP web scripting environment) stack DVD-Store application running on the Red Hat Enterprise Virtualization platform.

Why should I care?

DVD-Store is a simulated e-commerce environment that can be used to determine the scalability of Red Hat Enterprise Virtualization for hosting transactional web applications. Good performance on this test means good performance for your LAMP applications.

What was tested?

"DVD STORE" LAMP APPLICATION		
APACHE HTTP SERVER	PHP	MySQL
RED HAT ENTERPRISE LINUX 5.4 GUEST		
RED HAT ENTERPRISE LINUX 5.4 (WITH INTEGRATED KVM HYPERVISOR)		
HP PROLIANT DL370 G6 (INTEL XEON W5580-NEHALEM)		

What was the result?

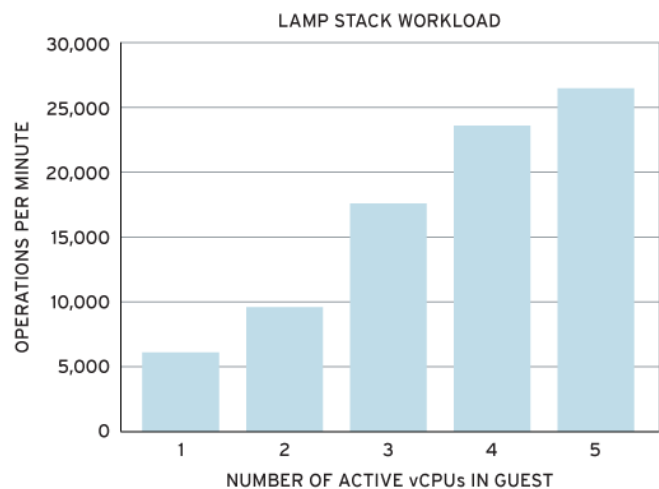
Red Hat Enterprise Virtualization scaled well, with low overhead costs of virtualizing multiple hosts and multiple virtual CPUs. **Red Hat Enterprise Virtualization exhibited performance superior to bare metal in certain configurations.** The DVD-Store application is unable to effectively utilize all 16 logical CPUs in a bare metal configuration. By mapping the application stack to 4 x 4-vCPU virtual machines, for example, the application achieved better performance than a 16 logical CPU bare metal architecture on the same physical hardware.

SCALE-UP YIELDS UP TO 87% OF THEORETICAL MAXIMUM PERFORMANCE. SCALE-OUT YIELDS 110%-139% OF BARE METAL PERFORMANCE.

The performance of the LAMP web server stack was measured on Red Hat Enterprise Virtualization running on a two socket Intel Nehalem server with 16 logical CPUs.¹ Red Hat Enterprise Virtualization exhibited excellent scaling and performance across multiple configurations.

Scale-up of single VMs with 1, 2, 4, 6 or 8 vCPUs yields up to 87% of expected maximum performance. Scaling up multiple VMs with multiple vCPUs on a single host also exhibits minimal loss of performance due to virtualization overhead.

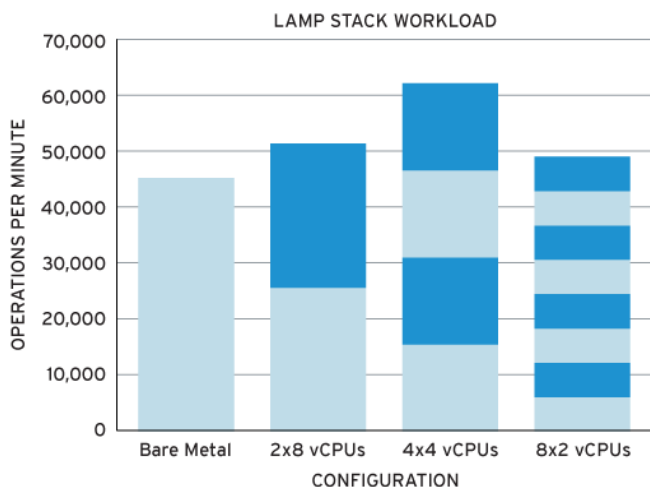
SCALING vCPUs AND MEMORY OF A SINGLE CLIENT



Scale-out of multiple virtual guests on a single host shows higher operations per minute than with bare metal on the same host—virtualization allows application performance scaling beyond the limitation of the bare metal application, providing better utilization of hardware resources.



VIRTUALIZATION EFFICIENCY: CONSOLIDATION



WHAT WAS THE GOAL?

Red Hat tested the performance of the industry-standard LAMP web application stack hosted on Red Hat Enterprise Virtualization. Red Hat chose DVD-Store, an e-commerce application simulation based on LAMP, as the target for its performance testing. The results of Red Hat's DVD-Store testing are scalability and performance measurements that are relevant for other LAMP applications that provide insights into sizing and configuration of infrastructure for LAMP application virtual hosting.

WHAT WAS TESTED?

DVD-Store is a complete three tiered e-commerce test application, representing an on-line DVD-Store. The Presentation Layer represents customers using web browsers to search for and purchase DVDs on the on-line DVD-Store. The Application Layer consists of the Apache HTTP web server which hosts the web pages that constitute the application. The web pages, written in PHP contain code that read the requests submitted by the user, access the back-end MySQL database and write the appropriate HTML code back to the browser. The Database Layer consists of the MySQL Database Server.

Testing was performed on an HP ProLiant DL370 G6 server with two Intel W5580 processors. These are 3.2 GHz quad-core processors that support Hyper-Threading Technology, so there are 8 physical cores, but 16 logical CPUs through hyperthreading. The host system has 48 GB of memory. 2.5GB per vCPU was allocated, leaving some memory for the hypervisor and for guests that may have oversubscribed the available CPUs. A constant database size of 4GB was used for testing.

Scaling Up the VMs

First, the performance of the DVD-Store application was measured by loading a single VM on the server, and assigning it 1, 2, 4, 6 or 8 vCPUs in the VM. As shown in the graph "Scaling vCPUs and Memory of a Single Guest" above, the performance scales linearly to 6 vCPUs, and then shows diminishing performance benefits due to virtualization overhead and application scaling limitations.

Scaling Out the VMs

A second series of tests involved scaling out multiple VMs of 2, 4 or 8 vCPUs to total the 16 logical CPUs in the server. The performance of the application shows good scalability and linearity.

Better than Bare Metal Performance

An interesting effect of virtualizing and scaling the DVD-Store application is shown in the Virtualization Efficiency graph, which compares bare metal performance to multiple VMs hosting a total of the 16 cores in the server as virtual CPUs. Note that configurations of multiple VMs sharing all the resources of the physical server actually outperforms bare metal. By splitting the application load across multiple VMs, the DVD-Store application is able to better exploit the resources of the physical server.

WHAT NEXT?

For more information, please go to <http://www.redhat.com/rhev/server> or contact your local Red Hat Enterprise Virtualization reseller.