



RED HAT ENTERPRISE VIRTUALIZATION: SCALING ORACLE DATABASE

EXECUTIVE SUMMARY

The goal

Determine the scalability of Oracle database workloads running on the Red Hat Enterprise Virtualization platform by running an Oracle Online Transaction Processing (OLTP) workload across different scenarios.

Why should I care?

OLTP is a common database implementation exercising both the memory and I/O subsystems of virtual machines. Good performance on this test means good performance for your database applications running on Red Hat Enterprise Virtualization.

What was tested?

OLTP Workload	Performance measured of the OLTP workload using a two-socket, quad core Intel Nehalem server with 48GB of RAM. Tested scalability across multiple configurations of virtual guests.
Oracle 10g	
Red Hat® Enterprise Linux 5.3 Guest	
Red Hat® Enterprise Linux 5.4 (with Integrated KVM Hypervisor)	
HP ProLiant DL370 G6 (Intel Xeon W5580 - Nehalem)	

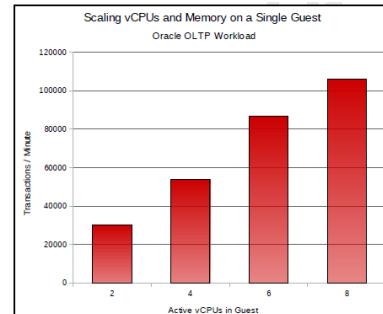
What was the result?

Red Hat Enterprise Virtualization scaled nearly linearly in all configurations tested, with low overhead costs of virtualizing multiple hosts and multiple virtual CPUs. **Oracle workload performance on Red Hat Enterprise Virtualization scaled equally well in increasing numbers of virtual machines/host and numbers of vCPU/guest.** Red Hat Enterprise Virtualization affords architectural flexibility in deploying virtualized Oracle workloads.

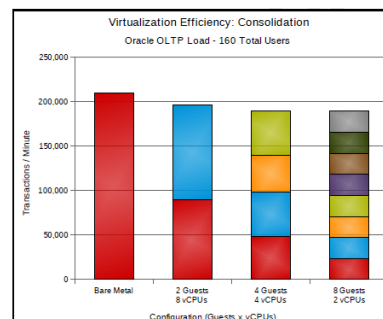
ORACLE DATABASE AT UP TO 93% OF BARE METAL PERFORMANCE, GOOD SCALABILITY

The performance of Oracle database workloads 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 a single VM with 2, 4, 6, or 8 vCPUs yields good scaling. As vCPUs are added, throughput per vCPU decreases slightly due to IO contention, lock management, and virtualization overhead. Scaling up multiple VMs with multiple vCPUs on a single host also exhibits good scaling.



Scale-out of multiple virtual guests on a single host shows 90-93% of bare metal performance on the same host and almost no difference between scaled-up and scaled-out virtual machines, reflecting Oracle's suitability for either architectural strategy.





WHAT WAS THE GOAL?

Red Hat tested the performance of Oracle database workloads on Red Hat Enterprise Virtualization. Red Hat chose an Oracle Online Transaction Processing (OLTP) workload, a popular type of workload for database servers, as the target for its performance testing. The results of Red Hat's Oracle testing are scalability and performance measurements that are relevant for Oracle database workloads that provide insights into sizing and configuration of infrastructure for relational database virtual hosting.

WHAT WAS TESTED?

The OLTP workload emulates a common database workload that typically taxes both the memory and the I/O subsystems of database servers.

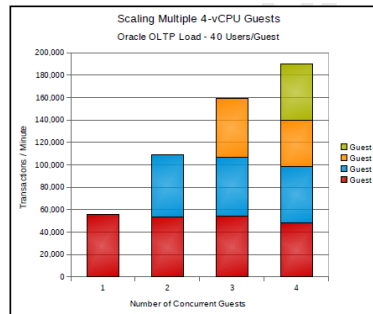
Testing was performed on an HP ProLiant DL370 G6 server with two Intel W5580 processors. These are 3.2 GHz quad-core processors that support Hyper-Threading Technology, so there are 8 physical cores, but 16 logical CPUs through hyperthreading. The host system has 48 GB of memory and used one MSA2212fc and three MSA2324fc fibre channel storage arrays. The guest operating system was Red Hat Enterprise Linux 5.3.

Scaling Up the VMs

First, the performance of the OLTP workload was measured by loading a single VM on the server, and assigning it 2, 4, 6, or 8 vCPUs in the VM with 2.5 GB memory for each vCPU. As shown in the graph "Scaling vCPUs and Memory of a Single Guest" above, the total throughput increases although the throughput per vCPU decreases slightly as vCPUs are added as a result of IO contention, distributed lock management, and virtualization overhead.

Scaling Out the VMs

A second series of tests involved scaling out multiple VMs of 2, 4, or 8 vCPUs with 2.5 GB memory per vCPU. The performance of the OLTP workload shows good scalability as shown in the graph below.



Oracle Workloads Show Good Consolidation Efficiency and Performance Versus Bare Metal

As shown in the graph "Virtualization Efficiency: Consolidation" above, the Oracle workload scales up (high number of vCPUs per guest) and out (high number of guests with same number of vCPUs) equally well on Red Hat Enterprise Virtualization, giving users added architectural flexibility.

WHAT NEXT?

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

ADDITIONAL INFORMATION

For additional details of the Oracle database testing performed by Red Hat on Red Hat Enterprise Virtualization, please reference the document entitled "Scaling Oracle 10g in a Red Hat Enterprise Virtualization Environment," part of the Red Hat Reference Architecture series at http://www.redhat.com/rhel/resource_center/reference_architecture.html

1. The Nehalem architecture features both multiple physical cores (in this case 4 cores per physical CPU) and hyper-threading technology (which allows one physical core to function as two logical CPUs). Thus, the two socket, quad core Nehalem server used here provides $2 \times 4 \times 2 = 16$ logical CPUs.