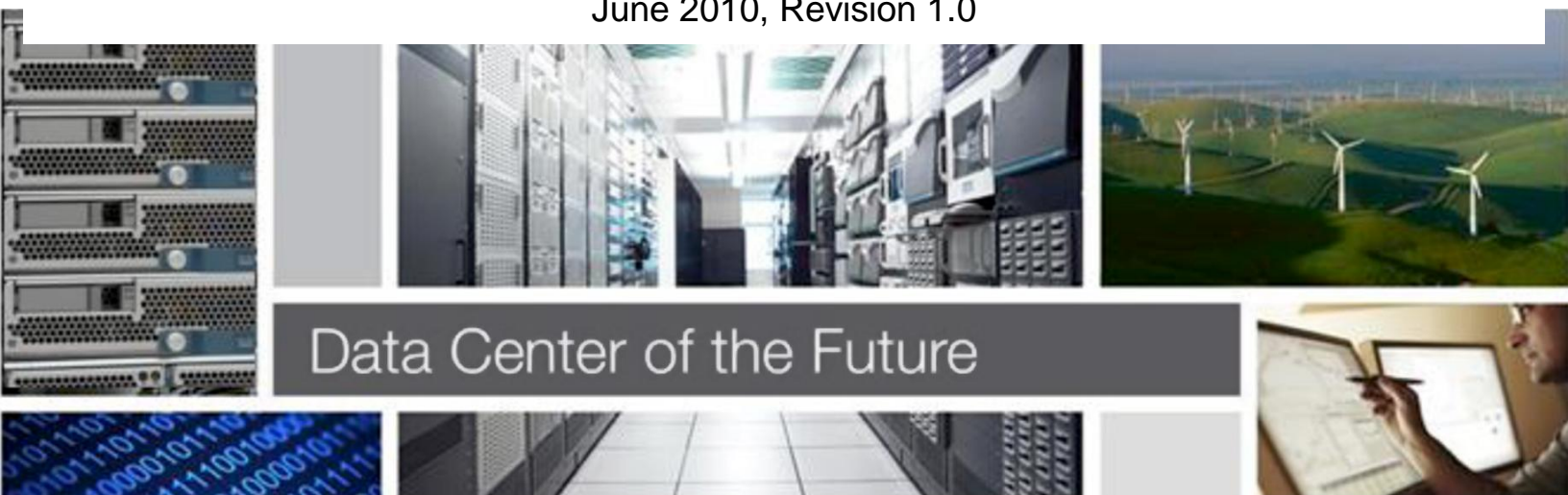# Using VMware VMmark Benchmark Results to Compare the Virtualization Performance of Servers

An Introduction to the VMware VMmark Benchmark

White Paper

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Data Center of the Future

Contents

Introduction to the VMware VMmark Benchmark

The VMware VMmark benchmark is a benchmark designed by VMware to model a server consolidation scenario. The original benchmark specification and test harness for VMmark 1.0 was published in 2007 and modeled the standard workloads found in the data center at the time: a database server, a file server, a web server, a java application server, and a mail server.

What Is a Tile in VMware VMmark?

The VMware performance team took the standard five workloads and consolidated them onto a single two-socket Pentium 4–based server. To increase the memory requirements for the benchmark, they also added a "standby" server: a virtual machine that was standing by in case of some failure (this virtual machine does no real work during the course of the benchmark but still consumes resources). The virtual machines were designed to be a blend of 32-bit and 64-bit operating systems and a blend of Linux (SUSE Linux Enterprise Server [SLES]) and Microsoft Windows. Together, the six virtual machines (database server, java server, mail server, web server, file server, and standby) became known as a "tile."

Each virtual machine in a VMware VMmark tile runs its own benchmark, as shown in Table 1.

**Table 1.**   The Six VMware VMmark Benchmarks

Virtual Machine	Benchmark	Operating System	Virtual Machine Specifications
Database server	SysBench with MySQL	SLES 10 x64	2 virtual CPUs (vCPUs) and 2 GB RAM
Mail server	LoadSIM (Microsoft Exchange)	Microsoft Windows 2003 x86	2 vCPUs and 1 GB RAM
Java server	Modified SPECjbb2005	Microsoft Windows 2003 x64	2 vCPUs and 1 GB RAM
File server	Dbench	SLES 10 x86	1 vCPU and 256 MB RAM
Web server	Modified SPECweb2005	SLES 10 x64	2 vCPUs and 512 MB RAM
Standby	None	Microsoft Windows 2003 x86	1 vCPU and 256 MB RAM

VMware VMmark Scoring

The VMmark benchmark runs for 3 hours, capturing benchmark scores over three intervals of 1 hour each. At the end of the test, the VMmark test harness aggregates and normalizes the scores of the five benchmarks in the tile over each of the 1-hour periods and ultimately comes up with three VMmark scores. The score that is published on the VMware VMmark website is the median of the three scores (higher is better).

Scaling the Tiles and the VMware VMmark Metric

Today's multicore servers are far more powerful than the two-socket Pentium 4–based server on which VMware VMmark was developed. For these modern servers, multiple tiles are run on a single server (Figure 1).

Figure 1. Multiple Tiles Running on a Single Server
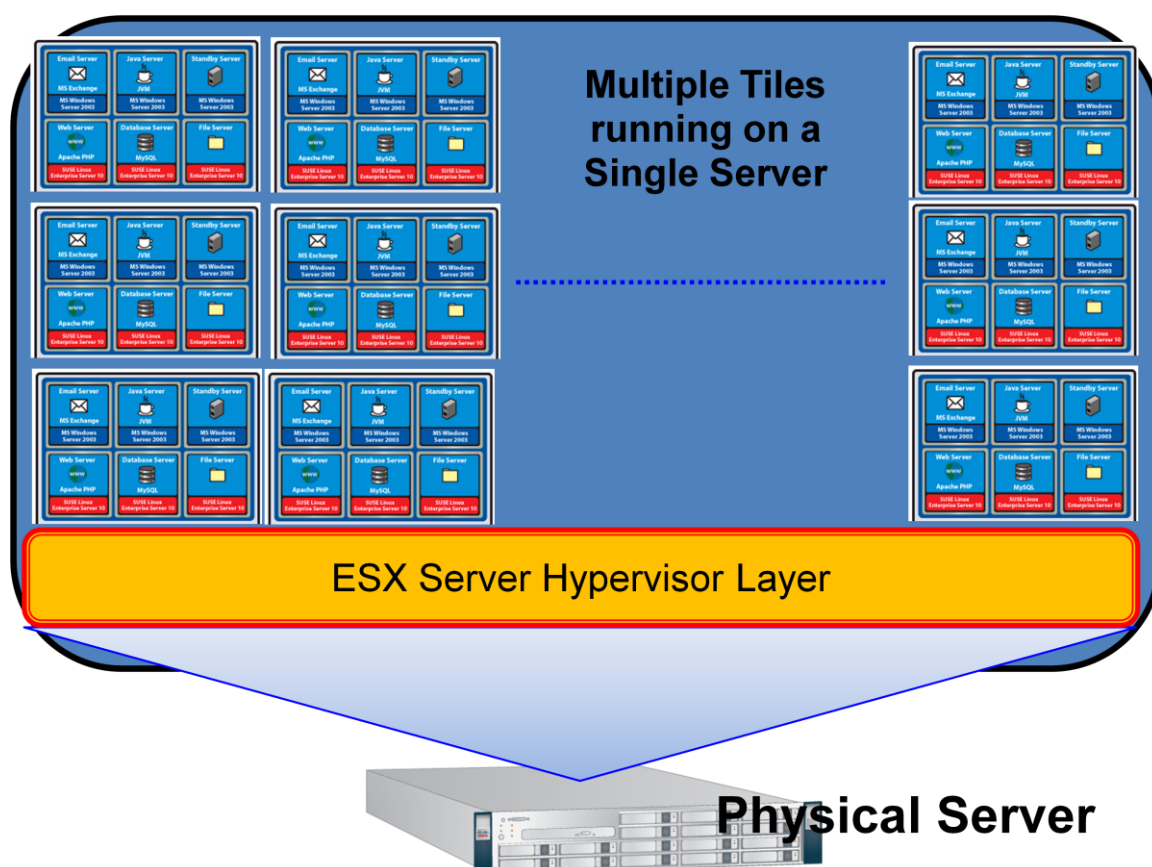
With multiple tiles, VMware VMmark sums the scores from the individual tiles, which results in a compound metric. For example, a VMmark score of 73.82@50 tiles means that a score of 73.82 was achieved while running 50 tiles. Keep in mind that each tile is six virtual machines, so a system running 50 tiles is actually running 6 x 50 = 300 virtual machines. In the example here, a server with a VMmark result of 73.82@50 tiles would be running faster than a server with a VMmark result of 72.25@51 tiles. However, the latter system would be running six more virtual machines. In general, the higher the score, the better the VMmark performance, regardless of the tile count.

Finding the Results

VMmark benchmark results are listed at the VMware VMmark benchmark website, and the results are listed by core count of the server tested. These results can be misleading since not all cores are equal, and a 32-core server may have a higher score than the 64-core servers listed at the top of the webpage. VMmark results can be found at http://www.vmware.com/products/vmmark/results.html.

Conclusion

The VMware VMmark benchmark is a measure of server consolidation performance on a VMware hypervisor. The benchmark uses a set of lightweight virtual machines known as a tile running fixed workloads to represent the consolidation. The results demonstrate that not all processor cores are created equal and that core count and gigahertz speeds cannot necessarily be used to determine system performance.

VMware® VMmark™ is a product of VMware, Inc. VMmark utilizes SPECjbb2005® and SPECweb2005®, which are available from the Standard Performance Evaluation Corporation (SPEC)

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