

Supercharging Your Computer Room

Server virtualization delivers
efficiency and flexibility



Server virtualization is one of the hot, new techniques being adopted by companies of all sizes, to reduce management and administration overhead — arguably the largest component of IT budgets these days. In addition, virtualization can help to reduce hardware costs through improved utilization and capacity management; enhanced offsite provisioning; and quickened responses to changes in load and resource demands.

Computer virtualization — allowing multiple “virtual machines” (VMs) to run on a single machine — dates back to the 1960s, when it was used by companies such as IBM to “partition” large mainframes to facilitate making the system available to more users. Unlike applications running within an unvirtualized machine, each

VM has its own copy of an operating system, plus its own domain name and IP address, so data only flows between VMs through network connections. And if one VM fails, the others continue unimpacted.

System administrators, software developers, testers and tech support have been using virtualization, typically with software from VMware (now part of EMC Corp.), for a number of years. Running Windows, Linux, UNIX and Novell NetWare VMs on-demand lets system administrators avoid rebooting their desktop or notebook computers to manage across a variety of systems. For developers, testers and support staff, virtual machines provide quick access to multiple versions of an operating system and application environments

Virtualization helps IT consolidate from multiple and often

older underutilized machines, to small numbers of newer, high-performance hardware, taking up significantly less floor space and requiring less hardware management. The new machines can be “scale-out” — blade servers, putting up to dozens of servers into a chassis — or “scale-up” — high-performance four-way and eight-way servers, providing enough capacity to be shared — and dynamically reallocated as needed.

The Virtual Server

Within the past several years, thanks to a combination of optimization trends, computer virtualization has become an accepted server tool.

“Server virtualization lets a single hardware system act as if it were multiple virtual systems,” says Mike Beltrano Jr., product management supervisor, CDW. “This aids IT managers in server consolidation, which in turn improves hardware utilization, and reduces costs on future purchases in terms of hardware, power, cooling and space. Virtualization also improves server set up and provisioning times.”

Performance, of course, is an obvious concern. “Adding a layer of software to a system adds overhead, which can adversely affect the performance of the software running in the virtual machine,” acknowledges VMware cofounder and chief scientist Mendel Rosenblum in his ACM [Association for Computing Machinery] queue article, “The Reincarnation of Virtual Machines.” But, Rosenblum continues, “The benefits of successful virtual machine systems far outweigh any overhead that they introduce.”

And server performance — raw power, power per rack and price/performance ratios — keeps getting better. Powerful 64-bit hardware, based on x86 chips from AMD and Intel, and Intel Itanium chips, offers enough processing power, RAM and virtual memory capacities to support high-end applications or host dozens of VMs, each running smaller applications.

IT spending for hardware refresh and support for new applications are also driving the virtualization trend. Companies of all types and sizes are looking at virtualization as an enabler for server consolidation, and as a way to help provide capacity management and the flexible, agile and reliable IT platforms that new business requirements demand.

A Virtual Feast

Virtualization software is increasingly available for 32-bit and 64-bit x86 hardware platforms, and for Intel Itanium and 64-bit RISC (reduced instruction set computer) environments. VMware is arguably the best-known player in the server virtualization arena. With its VMware Server, which runs on a host OS (operating system) of either Linux or Windows 2000/2003 Server, and VMware ESX Server and VirtualCenter, which runs directly on the bare-metal hardware, VMware supports a wide range of 32-bit and 64-bit “guest” operating systems including Windows, Linux, Solaris and Novell NetWare.

Microsoft’s Virtual Server runs on a number of 32-bit and 64-bit versions of Windows, and supports a range of Windows versions as guest OS.

A number of leading manufacturers offer virtualization (or virtualization-like partitioning) tools that work with their operating systems such as HP/UX, IBM AIX and Sun Solaris. However, these may only allow you to multiple instances of the host OS.

Both VMware and Microsoft offer versions of their server virtualization software as free downloads. And in the next few years, system virtualization will be getting a hardware boost, as AMD and Intel begin incorporating silicon-level support for virtualization in many of their CPUs, which can be used by virtualization software vendors.

For example, notes Margaret Lewis, director of commercial solutions at AMD, “AMD virtualization will include a new processor mode — Guest Mode — for running a guest OS session; a new instruction VMRUN [Virtual Machine Run], which begins running the virtual machine’s code in guest mode; and Device Exclusion Vectors (DEV), which keeps devices from accessing memory.”

Virtual Machines, Real Benefits

“The typical utilization seen in servers, based on running VMware’s capacity planning tool, shows utilization at 5 to 10 percent overall, with some machines running at 80 or 90 percent,” according to Steve Fink, director of IT consolidation solutions, HP. “This means you’ve got a lot of underutilized capacity, and a few machines that are bottlenecks. You want to level that load, which can significantly reduce costs and improve operations by assuring that capacity always meets demand.”

Obviously, stretching hardware dollars through better use of current and new capacity is good. However, the big-bang value for virtualization is how it dramatically improves IT’s ability to provision service capacity for applications, reducing the time it takes to happen and reducing the human effort involved in making it happen.

Once created, a virtual machine can be “encapsulated” or saved into files, much like a system backup image — except, unlike a system image, the VM image includes not only operating system and application files, but also a representation of the BIOS (basic input/output system) and hardware. This allows you to save, copy and provision a VM to the server for zero-downtime maintenance. ▶

Server Virtualization — a Priority

Server virtualization is an action item on nearly every IT agenda these days. Tech research firm Gartner predicts that by the end of next year, 25 percent of Fortune 1000 companies will use partitioning — a key virtualization technology — for their Windows server deployments. And by 2008, the firm estimates, companies that don’t leverage virtualization technologies will spend 25 percent more for their Intel servers and 15 percent more for RISC (reduced instruction set computer) servers, including hardware, software, labor and space.

And unlike a restore of a software image, a VM file can be moved to a machine with different hardware. This not only gives you more flexibility in provisioning systems, but means that provisioning a backup site doesn't require identical hardware. That can offer significant savings and can reduce the need to keep backup hardware identical to live hardware.

"We've been seeing a revolution in the use of virtualization," states HP's Fink. "Two years ago, nobody was doing this on 32-bit systems. Now we have lots of stories of companies betting their business on virtualized Windows and Linux/UNIX servers." In two years or so, he predicts, "Instead of running a bunch of boxes, IT will be able to see a single platform and give the applications to the environment, not to a specific machine

— similar to what virtualization has done for storage. The implications to business continuity, cost structures and agility will be profound."

Cost Savings Rule

According to a 2006 survey by tech research firm IDC, half of respondents cited cost savings in maintenance, software, personnel and facilities as major motivators for pursuing virtualization. The survey also cites other motivations including simplifying management/maintenance, reducing floor space, and improving reliability and scalability.

The ability to move VMs from one machine to another, even if they have some hardware-level differences, also vastly

Drive Data-Center Optimization Through Virtualization

Server virtualization, along with storage and network virtualization, is seen as a key enabler for the next wave of data-center optimization. For IT, data-center virtualization promises a number of equally important benefits, including:

- Improving staff productivity by eliminating/reducing many provisioning and deprovisioning tasks
- Reducing application provisioning time and delays — and deprovisioning, i.e. reclaiming testbeds — from weeks to minutes
- Decoupling hardware provisioning and capacity management from application load management
- Reducing/controlling space, power and cooling requirements

Additional benefits that data-center virtualization can offer IT include supporting migration of legacy applications and their OS (operating system) versions to new hardware without the need to modify them; eliminating/reducing the need for backup/disaster recovery sites to have identical hardware or capacity; and helping IT meet compliance requirements.

Because of these potential benefits, more companies are exploring data-center virtualization technologies, and how they will help optimize IT operations.

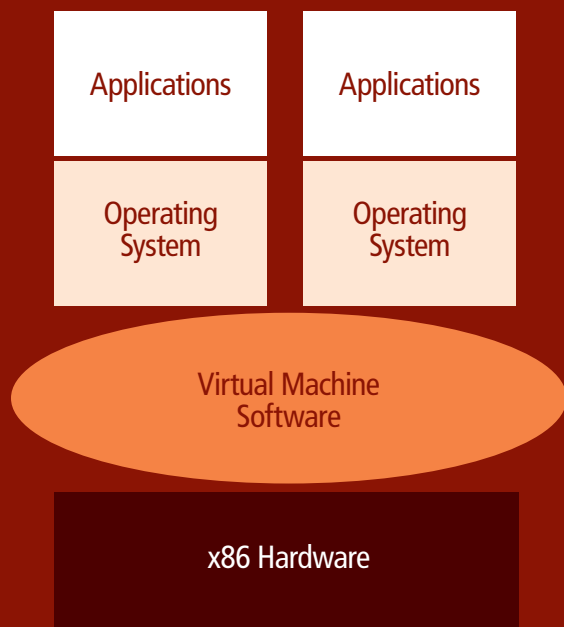
"I don't think there's a doubt that virtualization is a compelling technology," says Michael Reilly, founder, president and CEO, Foedus, a provider of virtual infrastructure technologies and services. "The big question for companies is how, when and where to integrate it."

"Probably 20 to 30 percent of people have a clear view of what data-center virtualization means, and the ability to do something about it," states Scott Clark, vice president of professional services, Egenera Inc., a virtualization-enabled blade vendor. "Another 40 to 50 percent are watching the first group, and there are 20 percent where it's not on their radar, or don't understand it."

A good place to start is with education on what's new in this rapidly evolving technology area, assessing where and how to deploy it productively — and identifying how virtualization will impact data-center aspects including facilities, power, cooling, space and support.

"If people don't learn how to operate in this new environment/technology, they'll never achieve its benefit," cautions Clark.

Virtual Machine Hardware/ Software Stack



simplifies hardware provisioning.

“You go from running five boxes, each running a task, to one box running five virtual machines, each running a task,” says HP’s Fink. “And you can reprovision that workload as circumstances change — with no rewiring, from a central location, using a common set of tools. This means lower costs, but more importantly, it means that changes can be executed effortlessly.”

Rich Lechner, vice president, virtualization for IBM Systems & Technology Group and Infrastructure Solutions sees virtualization as an example of “infrastructure in a box.” Additionally, Lechner points out, “This [virtualization] eliminates some of the networking gear and cabling normally needed to let separate boxes communicate, which can yield further savings. We have clients saving 25 to 30 percent in their network equipment.”

Virtualization’s improvements to resiliency and availability can be dramatic. Lechner reports that one IBM user, faced with the possibility of million-dollar penalties for not meeting a Service Level Agreement, set an objective of achieving a 60-minute recovery time from an unplanned outage. “Using virtualization, this client consolidated and simplified, and got the recovery time down to less than 30 minutes.”

Plan the Steps

“Start with boxes you’ve got, unless you want to use something like VMware ESX Server, which may need hardware you don’t have,” advises Gordon Haff, senior analyst and IT advisor deputy research director at research firm Illuminata Inc. “You may have hardware that is suitable if you add more memory.

“If all your existing servers are running business-critical production tasks, it will make sense to get a new server to ramp up virtualization. If you have some machines that aren’t doing anything, it makes sense to try [virtualization on] them. You want to experiment before you move your business-critical software.” A number of vendors have physical-to-virtual migration tools, Haff notes.

“Virtualization can have profound implications for your infrastructure,” IBM’s Lechner acknowledges. “But don’t let that scare you. Begin with a simple project, like consolidating a set of servers, or adding an application to an existing environment. Or use virtualization for a development and testing environment. Normally, it can take weeks to provision a test environment — and even longer to reclaim resources. With virtualization, it’s instantaneous.”

Don’t expect server virtualization and consolidation to completely reduce the complexity of your IT environment, Illuminata’s Haff cautions. “You still have to manage multiple OS copies — so you still have to patch them.”

And, Haff notes, because virtualization can create more OS images, and because you can archive them, you may end up with fewer physical servers but more software pieces to manage. So having a coordinated management strategy becomes more important.”



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