

# The Power of **VIRTUALIZATION**

Virtualization is surging.  
But only with effective  
management can the  
technology accelerate time  
to market, drive operational  
excellence, and reduce both  
IT and business risk.

| **By John W. Verity**



Virtualization has proven itself as a technically viable, highly reliable technology that's useful in a broad range of enterprise IT systems. But many CIOs still have one last series of questions on their minds: What are the financial benefits of this technology? What's the ROI? And how much can it save me?

The answer, in a nutshell, is that virtualization yields stellar savings in both capital and operational expenses, and remarkable ROI. This is especially true when IT managers properly plan the technology's implementation and ongoing monitoring and management. In fact, after factoring in savings on power, cooling and real estate, server virtualization typically pays for itself in just six to nine months, says Rob Smoot, Head of vCenter Product Marketing at VMware, a leading provider of virtualization software.

Such savings are bound to increase in coming years, experts say, thanks to steady improvements in hypervisor software from VMware and others, and to a new generation of multicore processors from Intel and AMD that have been architected specifically to enhance virtualization. Virtualization is "a golden ring that you need to grab," says Jack Santos, Executive Analyst at IT research firm Burton Group and a former CIO who has overseen virtualization projects. "It's definitely where you want to be."

Virtualization offers many economic benefits, Santos and other experts agree. The benefits start with a significant reduction in the number of physical servers that each enterprise will need to own, operate and maintain. From this reduction follow reduced energy usage, improved agility, lowered risk and improved recovery from everyday hardware failures as well as full-blown disasters. Also, because the basic building blocks of virtualization — known as virtual machines (VMs) — are defined purely in software, the technology opens the door to more extensive automation of data center operations, including provisioning. "Virtualization enables administrators to be much more productive and frees them to focus on strategic projects," says VMware's Smoot. "We have customers who now have a single admin manage hundreds of VMs, versus the industry average of [one admin for] 30 to 50 machines."

While some companies have used virtualization to reduce their physical server count as much as tenfold, even halving the number will yield significant gains. Fewer servers mean higher average CPU utilization rates, for instance, which translates into squeezing more productive work out of every physical server.

Consider the experience of AXA Technical Services, the IT infrastructure services arm of AXA Group, a global financial services firm. Before using virtualization, the unit's average CPU utilization had been 5 percent to 10 percent per physical server — at best, 15 percent, according to Antoine Najjar, Head of Architecture and Strategy at AXA. "When we look at the virtualized environment, we see an average of 35 percent to 40 percent, which is a significant improvement and still gives us room to grow," he says. "Virtualization is a big driver for cost efficiency."

Since 2003, AXA Technical Services has kept its physical server count essentially flat, at 10,000 units, while at the same time creating some 5,000 new virtual server instances. "All of our server growth

has been absorbed by virtualization," Najjar says. "If we hadn't gone with virtualization, today we'd be looking at 15,000 physical servers."

Similarly, the U.S. Veterans Administration (VA) is counting on virtualization to help slash the space needed in hospitals and other facilities to house server boxes and related gear by as much as 50 percent. According to Jeff Lush, Executive CTO, the federal agency has virtualized roughly 10 percent of its approximately 15,000 servers — many of which are scattered across the country, installed in closets here and there — and is moving aggressively to expand that figure.

Reductions of that size can lead enterprises to enjoy significant reductions in spending for floor space, electrical power and cooling. As a rule of thumb, cooling a server consumes just as much electrical power as running the machine itself does. So when a

## Key Steps to Virtualization

Roger Pilc, Corporate Senior VP and General Manager at CA, offers five guidelines for success:

- **PROFILE YOUR WORKLOADS:** Each workload behaves differently and has its own processor, memory, storage and network requirements. Analyzing these parameters is the best way to select workloads to run together on a given physical host, assuring each one of meeting its Service Level Agreement without overprovisioning hardware.
- **WALK BEFORE YOU RUN:** Early successes help win business managers' confidence in virtualization. Domain controllers, print and file servers, and app servers are the lowest-hanging fruit, followed by low-risk applications.
- **THINK OF SERVERS AND STORAGE TOGETHER:** Because these two technologies work hand-in-glove, virtualizing them at the same time can help avoid costly mismatches in the future.
- **THINK 'SINGLE PANE OF GLASS':** Virtualization puts many new objects into motion. Opt for tools that monitor and manage them all holistically, which will aid troubleshooting and performance management alike.
- **THINK VIRTUALIZATION MANAGEMENT:** Increase IT agility with automation, which enables dynamic, real-time responses to changing business demand. Reduce costs by streamlining complex processes and enabling lean practices. Improve service quality with real-time performance management of critical service levels. And reduce risks with real-time change and configuration management and privileged user management.

physical server is made virtual, the power savings alone can be significant.

Also, new multicore microprocessor architectures, such as Intel's Nehalem, can throttle up clock rates while lowering the power consumption of individual processor cores. That's an opportunity for yet more savings in operational expenses.

Even bigger savings may be reaped in the area of systems management. But the calculation here can be a complicated one, and as the car companies like to say, your mileage may vary. On the one hand, having fewer physical servers tends to simplify the management task. Because VMs running as guests on those host servers are essentially digital files, much of their management — provisioning, load-balancing, recovery from faults and so forth — can be automated with predefined scripts. On the other, virtualization creates

a new layer of infrastructure to manage; all those VMs can get out of hand if not managed properly, leading to VM sprawl and increased management costs.

"In theory, you can run the virtualized environment with fewer people," notes Roy Illsley, Senior Analyst at market watchers Ovum Ltd., "but only if you grasp the nettle." Essentially, that means restructuring the IT department both to use people as effectively as possible and fully tap the new synergies that virtualization makes possible. The benefits include the ability to cut across operational silos, making IT become more business-focused, and permitting IT resources to be realigned for greater efficiency. But a common mistake, Illsley warns, is to create a virtualization team separate from those that oversee the network, desktops, databases, applications and other

aspects of IT. Because virtualization tends to blur traditional boundaries and work routines, he says, having ill-defined teams can create an opportunity for finger-pointing.

"It takes a bold CIO to make the necessary structural changes," Illsley says. "People get it, but they think virtualization will disrupt IT and lead to bad service through the transition. So for the CIO, it's a double-edged sword." The remedy, he adds, is for the CIO to gain the board's support, then securely address the challenge.

But VMware's Smoot says a complete reorganization of the IT department may not be needed. In fact, even without organizational changes, virtualization makes data centers easier to manage, he says. If, say, a server fails at 2 a.m. on a Saturday morning, "with VMware technology an automatic failover to a new host machine or mirrored VM takes place, with little or no impact on end users," he says. If necessary, an admin may be alerted via BlackBerry. Then, the admin can log into the server complex, view the full management console on a home PC, and fix the problem.

## Virtualization Changes Everything

Virtualization is reshaping IT organizations from the inside out. The changes start literally inside today's servers. The latest microprocessors from AMD and Intel have been designed specifically to run virtual servers. In addition to doing more work while needing less electrical power, Intel's Nehalem and AMD's Istanbul microarchitectures include specialized instructions that supercharge their ability to shift attention, as it were, between any number of demanding guest servers, or virtual machines (VMs).

In fact, when running VMware's latest release of its virtualization software, vSphere 4.0, the chips enable a growing number of applications to run as fast on virtual servers as they do on physical servers — or even, in some cases, slightly faster. As that essentially eliminates the overhead of using virtualization technology, the idea of 100 percent virtualized data centers suddenly becomes both viable and attractive.

"The economics are too compelling to ignore," says Steve Kaplan, VP of the Data Center Virtualization Practice at INX Inc., a Houston-based IT professional services firm. "Now even the largest servers can be virtualized. That provides a whole new level of cost savings, both from hardware consolidation and lower software licensing costs, and because

virtualized environments can be made more secure and easier to manage."

Even e-mail servers, widely considered to be poor candidates for virtualization because they're so transaction-intensive, are succumbing. The U.S. Navy, for instance, is using vSphere to host a Microsoft Exchange server that manages about 500,000 mailboxes, notes Jim Sweeney, Principal Solutions Consultant at GTSI, a provider of professional IT services in the government sector.

Virtualization can also dissolve the organizational silos in most large data centers today. Server, storage and networking teams — now so isolated, Kaplan says, that "often, they've never met one another" — could become merged into one data center. The result: Data centers will be easier to manage strategically as CIOs are freed from the tactical, largely project budget-driven ways of the past. "Virtualization will level the playing field," Kaplan asserts.

The fully virtualized data center, should it come, will need to be efficiently managed. Many virtualized environments are already overprovisioned, experts say, and by applying analytics, this might be improved by 30 percent to 50 percent. In this way, IT departments can squeeze the maximum return from their remaining physical assets. — J.W.V.

### Incredibly Powerful

Flexibility and agility are invariably key topics in every discussion of virtualization, since each can yield strong economic payback. Virtual machines are extraordinarily easy to provision or replicate when demand for a particular app or service increases in response to changing business conditions. "Virtualization is a dynamic environment that lets you be very responsive and provision new capacity to ensure service levels," Smoot says. "This agility is incredibly powerful."

The VA's Lush agrees: "At the end of the day, what we really are trying to do is optimize the customer experience," he says. "Obviously, we expect virtualization to help us save money and be greener and whatever else. But the real question is: What can we do to have our applications go faster and be always available? What virtualization provides is on-demand-based computing. When demand increases, we can dynamically allocate new resources to satisfy that request."

Virtualization's ability to provision IT resources on demand can reduce risk. For example, Illsley suggests, when a marketing department launches an online campaign, it estimates the requirement for processing power as part of the budgeting process. If it relies on a physical server, there's a risk that the machine will be either too small for the job — leading to missed opportunities



— or too large — thereby wasting money. “But in the virtual world there is a pool of resources,” Illsley explains. “If it looks as if things are going great, the company can just add another virtual server. The cost of failure is significantly reduced.”

In addition, IT managers can enable less-technical users in other departments to reserve and provision servers for a limited time using a simple self-service Web interface. This kind of self-provisioning can succeed with the right management tools and strategies in place to let administrators easily establish and control both physical and virtual server pools, user profiles and automated build procedures. CA Spectrum® Automation Manager includes such capabilities out of the box. Without a holistic view, however, new kinds of problems may arise. There’s virtual sprawl, for instance, says Aid Galijatovic, a Director of Product Management at CA. That’s when VMs proliferate and consume resources, even after they’re no longer needed.

Even more critical, Galijatovic adds, is the challenge of diagnosing faults that affect IT’s ability to meet Service Level Agreements. Is the cause of a service outage or slowdown a hardware glitch, a problem at the hypervisor level, or a software issue in a guest VM? If these different layers of the technology stack are being monitored and managed independently of each other, it may take too much time to evaluate the flood of alerts and hone in on the root cause of the service level problem. It’s far more effective to monitor and manage physical and virtual resources through a single pane of glass.

“Our plan is definitely to manage virtual and physical servers together,” says Najjar of AXA. “In the past, we managed them instance-by-instance. But we hope to have a more complete and comprehensive view of the virtual environment.”

### End-to-End

Most point solutions that “see” into the hypervisor layer are not integrated with larger enterprise monitoring solutions, notes Jay Wink, Solutions Architect at CA. “It ends up being a black hole,” he says. The risk is that the network operating center (NOC) may interpret alarms as coming from VMs when, in fact, the issue is in the underlying hypervisor. Then the NOC may end up effectively chasing its own tail to figure out why there’s a performance problem. “To provide effective monitoring, customers need an enterprise solution that can determine root

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cause across the different technology silos — application, network, systems (including virtual) and database,” Wink says. “With this level of end-to-end monitoring, you can get ahead of performance problems before they affect the end user.”

The dynamic reallocation of resources that virtualization makes possible is a boon for both disaster recovery and business continuity plans. Monitoring and management tools can automatically recognize the signs of a failing system, then near-instantly shift production workloads to alternate servers or, if need be, to machines waiting on standby at remote data centers. This alone was a big sell for virtualization, recalls Santos of Burton Group. In his CIO days, prior to virtualization, Santos says, “Two or three times a year, I would send 20 people to a remote data center for a week of disaster-recovery drills. That took a lot of manpower and expense. But once we were on virtual servers, it was almost the flip of a switch. Then we needed to send only two or three people to drills, and for only two or three days.”

Adds VMware’s Smoot: “Virtualization enables disaster recovery for all of your virtualized apps, not just the few highest-priority ones.” The technology is easy to set up and test, he adds, and CIOs may not need a duplicate data center. “There are a lot of [capital expenditures] savings because a one-to-one relationship between an active and a passive site is not required,” he says. “For example, you can use your software development infrastructure for disaster recovery. You don’t have to have an exact replication of the production hardware.”

Still, experts caution CIOs to evaluate the technology carefully before implementing. Reaping the full technical and economic benefits of virtualization requires more than buying software to create virtual machines. A thorough understanding of an enterprise’s existing software and hardware infrastructure — how it’s configured and how it behaves minute by minute, day after day

— is essential. So is thoughtful planning and preparation.

Jim Sweeney, Principal Solutions Consultant at GTSI, a provider of professional IT services to the government, says many customers are too easily enraptured by the idea of virtualizing servers and too reluctant to consider precisely how they’ll reap savings. “I don’t want to assess,” they tell him; “I just want to do it.” Sweeney calls that attitude Pitfall No. 1. “They simply don’t know enough about their systems’ behavior — exactly how much CPU, memory and network each app is using, for instance,” he explains. “They just want to jump in.”

Further raising the stakes, many non-technical business managers still view virtualization as a somewhat exotic undertaking. The fact that end customers and application owners are hesitant to share infrastructure with each other is probably the biggest impediment to adopting virtualization — and to achieving its full economic benefit. If an app fails early on in the move to virtualization, people’s perceptions will be negative. Any high-profile problem will have a dramatic impact on the pace of your project and, in turn, on your ROI. It’s essential, therefore, to evaluate each app as a good candidate for virtualization. Detailed planning is essential to the success of these deployments, experts say. Start safe, seems to be the best advice, and then be more aggressive. Look at operational risk levels and challenge assumptions one by one, app by app, as you move forward.

VMware’s Smoot agrees: “It’s important to think about workloads before you consolidate servers,” he says. “Some applications require a lot of I/O; others have a need for CPU cycles. You need a strategy to balance these different requirements.” In other words, planning for success is virtually essential. ■

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JOHN W. VERITY writes about technology from Santa Rosa, Calif.