

White paper



Virtualization everywhere

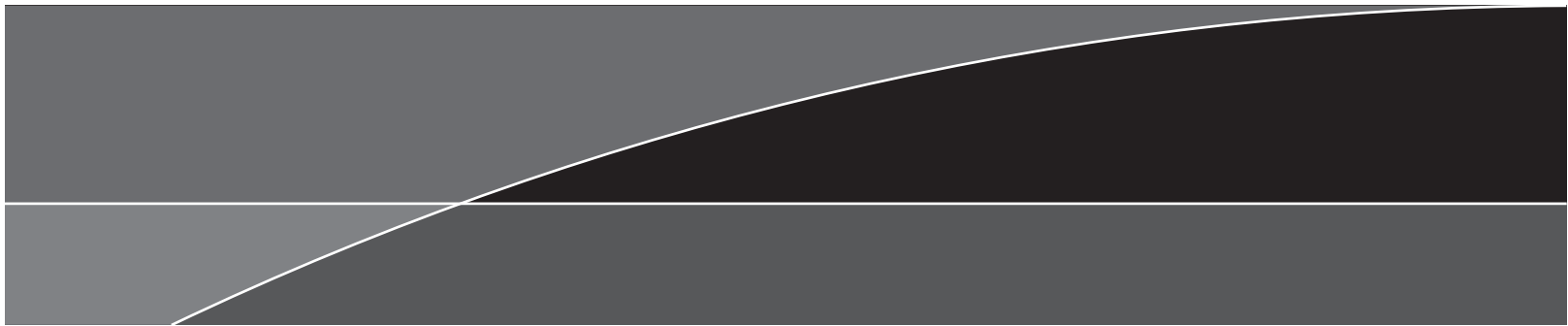


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Executive summary

Adoption of virtualization is concentrated among large enterprises, while adoption by mid-sized companies has been much slower. For these companies, enterprise-focused virtualization solutions often present barriers including:

- fragmentation between new, virtualization-ready operating systems and legacy platforms running mission-critical applications
- application performance constrained by storage and network I/O on virtualized servers
- server and storage constraints imposed by virtualization platform providers
- security and resiliency concerns raised when multiple critical applications run on the same hardware
- implementation hurdles created by complex interdependencies and demanding installation protocols
- vendor lock-in issues, raising pricing and support risks many companies prefer to avoid
- application delivery constraints imposed at virtual/physical boundaries

In this paper, we will discuss how Citrix XenServer™ provides simple, economical server virtualization designed for easy implementation in any IT environment. From the simplicity of “10 Minutes to Xen” installation to a full range of complementary, best-of-breed solutions from independent solution providers, Citrix XenServer offers innovative, cost-effective solutions for application availability, business continuity, rapid provisioning, and end-to-end visibility and management across virtual and physical environments.

“ We made a conscious decision to choose Citrix XenServer, Enterprise Edition because of its performance, price, ease of use and functionality. ”

Ryan McCarry, Managing Director, Sleek Networks

Introduction

After many years and multiple false starts, virtualization technology has entered the enterprise mainstream. Today, the technology is established: obsolete emulation technologies have given way to hypervisors capable of near bare-metal speeds, hardware support for virtualization is designed into the latest generation of Intel and AMD processors, and both operating systems and servers are shipping virtualization-ready. But, adoption by business users is split, with large enterprise organizations committed and underway, while most businesses are still examining the technology at arms' length.

Large enterprises are adopting virtualization

At the enterprise level, adoption of virtualization technologies is significant and growing fast. Server manufacturers are certifying the leading virtualization solutions at levels once reserved for operating systems, and the list of certified applications grows steadily. Most readers of this paper who work in large enterprises will already have had some experience with virtualization in development or even production environments.

Virtualization proves itself daily in large datacenters: it reduces direct and indirect costs of hardware and associated maintenance, electric power, cooling, datacenter floor space, and environmental impacts. It has the potential to improve management efficiency, hardware and staff utilization, and scalability. Virtualization has become a staple of the business press, and even skeptical, fad-averse IT managers are among its biggest fans.

But what about the rest of us?

Despite its momentum, virtualization has yet to take hold in the mainstream business market, where server volume is greatest. While 9% of new servers shipped are being virtualized, these servers are used disproportionately by enterprise and specialty customers, while only 2% of servers shipped to the rest of the market are used to deliver virtualization. Since most technologies diffuse quickly from enterprise to mid-sized businesses, what makes virtualization an exception?

Surprisingly for a solution that promises cost-effectiveness at the enterprise level, cost is a significant barrier to adoption for mid-sized businesses: many production-quality solutions have been priced out of reach for these businesses. To complicate the challenge, the all-or-none approach that some virtualization products require often dictates outright replacement of physical with virtual infrastructure, with no options for resource sharing, migration, or pooling that might ease the burden of adoption. Operational costs compound the problem as well: enterprise-grade management tools for virtualization are complex,

singular in purpose, and poorly integrated with existing tools and processes, and they don't work across the virtual /physical boundary.

It's time to look for ways to extend the benefits of virtualization to companies of all sizes, particularly mid-sized businesses. Citrix Systems has focused development of its XenServer product line on overcoming the implementation challenges of server virtualization faced by mid-sized firms, to bring the benefits of virtualization to every organization.

By considering Citrix within the full range of virtualization options available, every company can enjoy the benefits of a truly dynamic datacenter, without repeating costly mistakes such as:

- datacenter complexity
- introduction of security risks
- fragmentation and underutilization of key resources, including staff
- heterogeneity and incompatibility of hardware, operating systems, and applications
- datacenter sprawl compounded with poor manageability

In the following section, we will consider the specific adoption challenges that virtualization presents for mid-sized companies and how Citrix has addressed and neutralized each of them in its XenServer product line.

Virtualization everywhere

Server virtualization challenges for mid-sized companies

Server virtualization promises a new way of doing things, by dissolving old IT barriers and constraints. Paradoxically, some enterprise virtualization solutions impose new barriers and even tighter constraints that threaten to perpetuate the same problems mid-sized firms wrestle with today.

Fragmentation

Datacenter fragmentation, or heterogeneity, is an unpleasant fact of life for businesses of all sizes, but it hits mid-sized firms especially hard. Virtualization should reduce management burdens as it consolidates servers, but the reality is often very different.

Every operating system vendor is now introducing its own virtualization option, compatible with and optimized for the vendor's own latest operating system. Options for legacy operating system support — so firms can run their legacy applications —

are an afterthought, if they even exist. So for any organization that can't afford a "rip and replace" upgrade of operating systems and applications, this form of virtualization may actually add to operating system proliferation by isolating and increasing dependency on legacy applications running on legacy platforms.

Citrix XenServer is different. At its core is the lightweight Xen virtualization engine, which sits between the operating system and hardware-making full use of hardware capabilities, and which is optimized for high-performance support of every major operating system. Legacy operating system instances install as easily as on physical machines, and applications run smoothly and seamlessly.

Application performance

IT exists to run applications, and application performance is critical to both IT and the ultimate success of the business. But, even when virtualization leaves plenty of spare processor and memory capacity on the server, bottlenecks in disk and network I/O can significantly inhibit application performance.

This may not be a problem for enterprises with spare servers available for overprovisioning, but except for the largest enterprises, few businesses can afford all that standby capacity sitting unused. The lack of spare resources leaves businesses exposed to application performance problems with any spike in demand-at the worst possible time.

Citrix XenServer addresses application performance by taking full advantage of virtualization-ready operating system designs, such as paravirtualization, and hardware support for high-performance virtualized I/O. With XenServer, your operating system and your processor cooperate in the virtualized environment to give your applications the disk and network I/O performance they need for optimal reliability and end-user experience.

Server and storage options

Virtualization abstracts hardware from the operating system instances and applications running on it. It should be a big step in the direction of hardware independence-but not all solutions deliver both flexibility and performance.

Some virtualization architectures are narrowly focused on high-end enterprise hardware such as Fiber Channel storage. Others accept a broader range of hardware, but impose emulation overheads that can cut performance dramatically. Businesses that require both purchasing flexibility and performance can get caught in the middle.

Citrix XenServer supports a broad range of storage technologies and processor configurations including rack, tower, and blade servers. Major server vendors such as Dell and HP have certified

Citrix XenServer on their entire range of industry-standard server offerings. Finally, since the Xen hypervisor at the core of XenServer has been proven on platforms from cell phones to 1,000+-processor supercomputers, mid-sized businesses can count on Citrix for solutions to keep them prepared for future scaling capacity, no matter which turn technology takes.

Security and resiliency

“XenServer has given us a much more modular network environment. Because of this, we are not only able to offer our customers the highest level of service possible, but have also unexpectedly received a new level of security.”

Joanne McKinney, IT Director, Buyken Metal Products

Virtualization dissolves the physical boundaries between servers, operating systems, and applications, so it's just common sense to take a hard look at the vulnerabilities that such interdependence may introduce. While large enterprises can afford security specialists or consultants to monitor vulnerabilities and design high availability into their solutions, most firms need to rely on IT generalists, implementing only the capabilities and protections that come in the box.

Fortunately, security is a particular strength with open source development in general, and the Xen hypervisor powering XenServer is no exception. Reviewers and contributors to its development include some of the most security-conscious public- and private-sector organizations in the world. Among the security innovations they have vetted is Xen hypervisor's granular resource control, which grants permissions as needed. More important, the entire Xen hypervisor security architecture is discussed, designed, and implemented purely on its technical merit and in the open — there's no reliance on "security by obscurity." And clearly, the approach is working-as of February 2008, the Xen hypervisor has never been the subject of a vulnerability report.

XenServer also helps companies improve application availability. Its resource pool architecture is specifically designed for resiliency, with configuration and management information replicated throughout the pool to eliminate potential single points of information loss. And with the capabilities of XenMotion, a feature of Citrix XenServer, live migration of actively running virtual machines ensures that applications keep running even if the underlying hardware needs to be shut down. As a result, application uptime is effectively decoupled from hardware uptime, providing more flexibility and agility to mid-sized IT organizations.

The XenServer platform is also highly extensible, supporting a wide range of robust, high-availability options from partners. These options range from basic high availability to full enterprise-class fault tolerance for virtual machines. Delivered and integrated by Citrix® Solution Advisors worldwide, these high-availability solutions offer robust, cost-effective application resiliency needed by companies of all sizes.

Implementation hurdles

Many of the issues discussed above are the result of implementation barriers for virtualization solutions, such that they are affordable at enterprise levels but out of reach for most other organizations. For most companies, virtualization solutions designed for enterprise customers require too much initial investment-in software and servers, installation time and effort, storage solutions, application upgrades, management tools and staff, and more-to be a realistic alternative.

Nor is cost the only hurdle: the time and risk required to replace working, incumbent, best-of-breed infrastructure with unproven, virtualization-specific alternatives is just too high. When staff is fully utilized, every hour spent on training and process engineering comes out of service to customers and end users.

What is needed is what Citrix XenServer offers: a genuine “10 minutes to Xen” installation that works with best-of-breed tools, including:

- Distributed resource management and high availability from Platform Computing
- Lab automation solutions from VMLogix
- Fault-tolerant virtualization from Marathon Technologies Corporation
- High-performance networking for critical workloads from Solarflare Communications
- Management for heterogeneous hypervisors from ToutVirtual Inc.

To work across the boundary between virtual and physical infrastructure, Citrix offers Citrix XenServer, Platinum Edition with integrated provisioning that delivers dynamic infrastructure using a company’s existing hardware and software. XenServer, Platinum Edition unlocks the full value of end-to-end virtualization, with built-in capabilities for virtual development and test followed by physical deployment, moving workloads from physical to virtual and back as demand and availability requirements dictate.

Vendor lock-in

Most mid-sized businesses avoid IT initiatives based on single-vendor solutions. Unlike a Fortune 50 enterprise, they can’t “go it alone”, or pressure a supplier to meet their requirements. When

a virtualization vendor bundles unrelated offerings-proprietary storage tools, for example-or positions itself in competition with operating system vendors, red flags go up.

Citrix takes the opposite approach. Microsoft® Hyper-V, the virtualization solution in Microsoft® Windows Server® 2008, is based on a virtualization model similar to that of Citrix XenServer. More importantly, Citrix and Microsoft have committed to providing fully-interoperable, “plug-compatible” virtual machines to ensure that virtualized workloads are portable between XenServer and Hyper-V. And instead of competition, Citrix and Microsoft have announced a joint roadmap for shared services and management tools. Firms can count on compatible, interoperable alternative sources and stay focused on their business, undistracted by industry and technology squabbles.

Application delivery

Servers exist to support the applications used by employees and customers, but much of the discussion about virtualization focuses on operating systems and other datacenter issues. Virtualization of desktop PCs and applications is rarely discussed along with server virtualization, even though both must be included in any end-to-end solution. Looking at virtualization piecemeal today all but guarantees fragmentation, incompatibility, and underutilization tomorrow.

This is particularly important for mid-sized firms, because the costs of installing, maintaining, and delivering applications are proportionately greater for them. Worse, artificial barriers between virtualized datacenters, desktops, and the applications running on them are barriers to growth that fast-moving mid-sized firms simply can’t afford.

Citrix is uniquely prepared to dissolve these barriers. Years of offering the industry’s leading application virtualization and delivery solutions have honed Citrix’s expertise in aligning technologies across the datacenter and out to users to deliver high-performance applications for business effectiveness as well as datacenter efficiency. The comprehensive portfolio of solutions offered by Citrix, including Citrix XenDesktop™, Citrix XenApp™ and Citrix XenServer for desktop, application and server virtualization, respectively; Citrix® NetScaler® for Web application delivery; Citrix Access Gateway™ for secure application access; and Citrix WANScaler™ and Citrix EdgeSight™ for visibility, acceleration, and optimization, defines the fundamental application delivery infrastructure that spans the physical/virtual boundary.

Once applications are abstracted from the underlying operating system and physical infrastructure-the ultimate goal of virtualization-IT can respond to business requirements quickly and effectively wherever they arise. With XenServer, Platinum Edition, for example, IT organizations are able to provision and manage hundreds of virtual and physical servers and storage

resources and consolidate them into a dynamic pool of resources that can be repurposed in minutes.

Making the choice for Citrix XenServer

Unlike "futureware" or giant solutions with complicated deployment and arcane installation, XenServer is a practical consideration right now. Get your "10 minutes to Xen" now by downloading a free trial of Citrix XenServer, Enterprise Edition—available at <http://citrix.com/xenserver>. You can explore and evaluate the industry's most open, future-prepared virtualization solution immediately. Plus, there's no need to wait for equivalent technology packaged with Microsoft Windows Server 2008—your XenServer virtual machines will be plug-compatible with Microsoft's offering.

With XenServer, you can also count on a knowledgeable and vibrant support community. See how well it works at <http://support.citrix.com/forums>. Of course, in-depth, local support for XenServer is always available from the extensive network of Citrix Solution Advisors.

Virtualization: beyond consolidation and economy

IT organizations see virtualization as an opportunity to consolidate infrastructure and operations to improve utilization and cut costs. That is exactly right. But as virtualization enters the mainstream, corollary benefits—some of them unanticipated—are emerging, and may someday rival the benefits for which virtualization was originally developed. These are just a few:

- innovative, cost-effective approaches to disaster recovery and business continuity
- higher application availability implemented by virtual machines running in pooled configurations
- supporting training, testing, and development environments with a fraction of the physical resources and isolated from the production IT environment
- applications and desktops that are fully portable across physical and virtual machines
- seamless, flexible provisioning across mixed physical and virtual environments, including storage and networks as well as servers

With an open platform, a broad ecosystem of independent solution providers is available to create innovative, complementary solutions that suit the unique needs of different IT environments. By definition, proprietary solutions will ultimately lag behind the rest of the market. The open, lightweight, loosely coupled architecture of XenServer has attracted numerous supporting, enabling, and extension technologies that are available today and that continue to grow in number and significance.

The choice is right; the time is now

Citrix XenServer virtualization offers advantages for IT organizations, departments and businesses of any size. Comprehensive virtualization in the datacenter — from server to application to desktop — simplifies administration as it delivers improved service levels for improved business agility. New capabilities such as scalable, managed hosting improve IT's contribution to the bottom line. Whole new classes of service-oriented applications can be delivered anywhere on demand for dynamic response to changing business requirements. And individual IT professionals can build on their Microsoft expertise by choosing a platform that shares both interoperability with and support from Microsoft.

With the emergence of virtualization technologies into the mainstream, today's critical choices will help avoid technological blind alleys and unlock the present and future benefits of virtualization for IT organizations and the businesses they serve. Start now, at <http://citrix.com/xenserver>.

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About Citrix

Citrix Systems, Inc. (Nasdaq:CTXS) is the global leader and the most trusted name in application delivery infrastructure. More than 200,000 organizations worldwide rely on Citrix to deliver any application to users anywhere with the best performance, highest security and lowest cost. Citrix customers include 100% of the *Fortune* 100 companies and 99% of the *Fortune* Global 500, as well as hundreds of thousands of small businesses and prosumers. Citrix has approximately 6,200 channel and alliance partners in more than 100 countries. Annual revenue in 2007 was \$1.4 billion.

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