



# THE BUSINESS BENEFITS OF VIRTUALIZATION AND CONSOLIDATION WITH SUN AND VMWARE

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## **Abstract**

The combination of server technologies from Sun and virtualization technology from VMware can disrupt the status quo in IT environments and provide organizations with a new set of choices that can increase flexibility, reduce cost, and attack space, power, and cooling issues head-on.

VMware Infrastructure software provides a true Virtual Datacenter Operating System that aggregates servers, storage, and network hardware to deliver benefits that include server consolidation, higher systems availability, and rapid deployment for new application workloads. Sun and VMware provide proven hardware and software solutions to match IT resources to demanding business requirements.

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## Chapter 1

# Introduction

Enterprise datacenters provide the availability and predictability necessary to deliver dependable, secure IT services. Yet all too often, datacenters are also a source of inefficiency, server sprawl, low utilization rates, redundant management, and administrative tasks. These issues can add up to excessive cost, complexity, and risk. The reasons behind these issues can be traced to the history of many datacenters:

- As IT organizations have deployed applications over the years, they have tended to implement silo architectures, where each silo is configured with its own server, storage, and network infrastructure. Resource sharing between silos is virtually non-existent, because each one has its own brand of servers, and each server is sized to handle the maximum imaginable workload. Applications are bound to specific hardware, and scaling or adapting them to meet new demands is a challenge.
- As business needs have evolved and new applications come on line, many of the old applications and the server upon which they run haven't been retired.
- Historically, application architecture best practices have dictated the use of separate servers per function as a way to isolate performance, scalability, and security issues, a trend which has contributed to even lower server utilization and has also limited resource sharing between functions.

## Disruptive Technologies from Sun and VMware

The combination of server technologies from Sun and virtual infrastructure software from VMware can disrupt the status quo in IT environments and provide organizations with a new set of choices that can increase flexibility, reduce cost, and attack space, power, and cooling issues head-on. This powerful combination of technologies can be used to re-host legacy applications while providing a standard platform for all future application deployments.

- The datacenter of the future is built on Sun hardware and VMware Virtual Datacenter Operating System software that liberates organizations from dedicated servers and allows them to use flexible, interchangeable, high-performance, general-purpose computing systems. VMware Virtual Datacenter Operating System software helps IT organizations to realize rapid ROI from reduced capital and operational costs. VMware Virtual Datacenter Operating System helps increase business agility by facilitating dynamic deployment of applications and workloads in virtual machines across an industry-standard server infrastructure.
- The power of Sun™ x64 servers, powered by AMD Opteron™ and Intel® Xeon® processors, is such that performance is no longer a reason to deploy a single function per server. With the workloads of multiple legacy servers consolidated

onto a single server, IT organizations can economize on space, power, and cooling. Sun's use of open standards in its x64 server product line means that organizations can use a single platform to host applications that are based on the Solaris™, Linux, or Microsoft Windows Operating Systems on the bare metal or in a virtualized environment. With the choice of a single product line from Sun, IT organizations can deploy applications based on one operating system today, and re-deploy the same servers using a different operating system tomorrow.

- VMware Virtual Datacenter Operating System software supports the datacenter of the future, today. It helps IT environments operate with fewer hardware servers. With server virtualization at the core, Virtual Datacenter Operating System runs multiple operating system instances on a single physical server. VMware Virtual Datacenter Operating System software provides resource controls to manage service levels as well as features that help securely isolate each OS/application workload instance. VMware Virtual Datacenter Operating System dynamically allocates CPU, Memory and I/O resources to applications by moving virtual machines autonomically and with no user downtime.

To ease migration from physical-to-virtual infrastructures, VMware Converter facilitates moving legacy applications from obsolete, power-hungry servers onto state-of-the-art Sun x64 servers without the need to re-create existing operating system installations.

For new applications and workloads, VMware Virtual Datacenter Operating System simultaneously manages multiple instances of the Solaris 10 OS as well as multiple versions of Linux and Microsoft Windows along with Novell Netware OS.

- Sun's comprehensive server and blade system product line is the right choice for datacenters having to work within space, power, and cooling constraints. Sun gives customers a choice between powerful AMD Opteron and Intel Xeon processors so they can use the technologies that offer the best performance for their specific application. The Sun Fire™ X4600 M2 server, with eight sockets, can support up to 32 cores in 4 rack units. This server, powered with Quad-Core AMD Opteron processors, is optimized for virtualization with the memory footprint to support multiple OS instances per server. The Sun Fire X4450 server now comes with the Intel® Xeon® processor 7400 series with 6 processing cores, making it the first and only 4-socket, 24-way, 2U server, and an excellent choice as a virtualization platform. The Sun Blade™ 6000 Modular System, when populated with 10 four-socket Sun Blade X6450 Server Modules, supports 240 processor cores in a mere 10 rack units when populated with six-core Intel Xeon processors. Move the same blades into a Sun Blade 6048 Chassis and customers can harness the power of 1152 processor cores in a single rack.

VMware Virtual Datacenter Operating System aggregates servers, storage and networks to make it easy to match IT resources with the changing demands and requirements of the business. Virtualization opens the door to strategic initiatives such as server and storage consolidation, disaster recovery, business continuity and virtual desktop infrastructures.

No two companies provide more complete, mature, and proven virtualization solutions than Sun and VMware. More than 120,000 customers worldwide use VMware Infrastructure software to help maximize the manageability, flexibility, and efficiency of their datacenter. And Sun's vision of a virtual datacenter is redefining how IT services are designed, deployed, and managed in mission-critical environments. Together, Sun and VMware offer a virtual datacenter solution that works in the real world.

## Chapter 2

# The Role of Virtualization

Virtualization technologies allow IT organizations to consolidate multiple workloads onto a single server, resulting in more efficient use of each server, and fewer of them to install, support, and manage. Virtualization is a technique that has been available for years, and it can be employed at many architectural levels. Virtual machine monitors (VMMs) comprise a class of technology that allows multiple heterogeneous OS instances to run on the same server, each of which has the illusion of running on dedicated hardware (Figure 1). Sometimes called a hypervisor, a VMM supports a virtual machine for each guest OS instance.

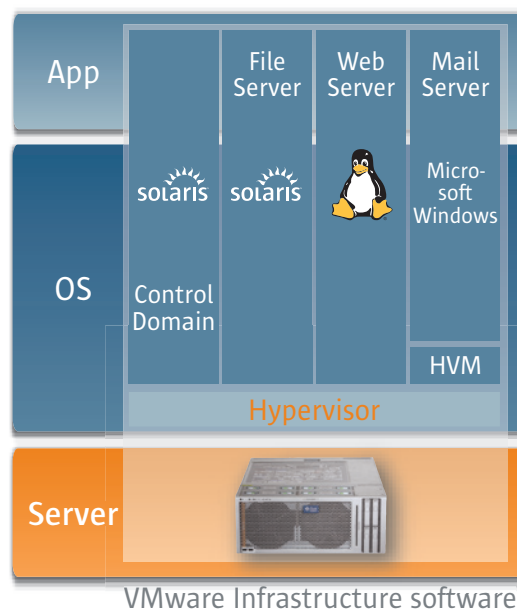


Figure 1. VMMs and hypervisors create a fully functional virtual machine that runs its own operating system and applications just like a physical computer.

## VMware Infrastructure Software

VMware Infrastructure software provides a hypervisor that virtualizes the hardware resources of an x86/x64-architecture computer—including the CPU, memory, disk and network interfaces—to create a fully functional virtual machine that can run its own operating system and applications just like a physical computer.

## Choosing the Right Hypervisor

The hypervisor is the foundation of a virtualized datacenter. Hypervisor choice is an important one that influences whether an IT organization can fully realized the benefits of a virtual infrastructure. Selecting the most robust, production-proven

hypervisor, such as that included with VMware Infrastructure software, helps to reduce risk and minimize the overhead of virtualization.

### The Benefits of Virtual Machines

A virtual machine is a tightly isolated software container that can run its own operating systems and applications as if it were a physical computer. A virtual machine behaves exactly like a physical computer and contains its own virtual CPU, memory, disk storage, and network interfaces.

When running in a virtual machine, an operating system can't tell whether it is running on a virtual machine or a physical server, nor can applications or other computers on a network. Nevertheless, a virtual machine is composed entirely of software and contains no hardware components whatsoever. As a result, virtual machines offer a number of distinct advantages over physical hardware:

- *Compatibility.* Virtual machines are compatible with Sun x64 servers powered by AMD Opteron and Intel Xeon processors.
- *Isolation.* Virtual machines are isolated from each other as if physically separated.
- *Encapsulation.* Virtual machines encapsulate a complete computing environment.
- *Hardware independence.* Virtual machines run independently of underlying hardware.

### Business Benefits of Virtualization

When IT organizations virtualize the hardware with hypervisor technology such as VMware Infrastructure, they empower themselves to make more flexible, dynamic choices in their application deployment and their allocation of resources — business benefits that affect the bottom line— including higher server utilization, improved service levels, ability to better meet changing business requirements, and increased business continuity and disaster recovery.

- *Instant provisioning.* When IT organizations standardize on an operating system and a specific set of patches, they can create a “golden master” virtual disk image, and deploy virtual servers simply by making new copies of the disk image files.
- *Zero downtime maintenance.* Through the use of VMware VMotion technology, the days of bringing applications down because of scheduled server maintenance are over. Instead, IT organizations use VMware VMotion to migrate running applications from a server they wish to take down to a backup server. With all applications moved off a server without disruption, it can be maintained or even replaced without any impact on service delivery.
- *Freedom from vendor-imposed upgrade cycles.* VMware Infrastructure virtualizes the hardware itself, including the processor, memory, disk, and I/O resources. Because the hardware that the operating system sees is virtual, not physical, the

OS and the software installed on it can be moved from server to server without concern for the underlying platform — freeing IT organizations from vendor-imposed hardware and software upgrade cycles.

- *Pooling hardware resources.* VMware Infrastructure virtualizes hardware resources. Rather than requiring storage systems to provide one or more secure, independent logical units to each guest operating system, IT organizations can manage a guest operating system's disk devices as easily as managing files on a single, shared, centralized storage system. The software allows administrators to create virtual network devices that pass network traffic between guest operating systems without the expense associated with switch hardware.
- *Virtual hardware to support legacy operating systems.* VMware Infrastructure provides guest operating systems with virtual servers they expect to see, including obsolete hardware required by operating systems such as Microsoft Windows NT. With VMware Converter, IT organizations can migrate entire environments from physical servers whose service plans have expired to virtual machines running on state-of-the-art Sun x64 servers. This helps address both performance and space, power, and cooling concerns by supporting multiple such environments per server.
- *Dynamic resource sharing.* Because VMware Infrastructure virtualizes disk drives as flat files, these files can be moved from server to server to optimize utilization levels and to manage service levels. Through VMware Infrastructure's resource management capabilities, IT organizations can tune the resources allotted to each guest operating system, enabling them to meet service-level agreements while making more economical use of hardware resources. Resource allocation can be used to manage complimentary applications on the same server. For example, it could be configured to favor a busy On-Line Transaction Processing (OLTP) database during the day, while favoring long-running data warehousing operations at night. For even more dynamic resource management, VMware VMotion technology can dynamically migrate running environments between servers, giving IT organizations the ability to respond to workload fluctuations in real time.
- *Security and Fault Isolation.* Virtualizing at the hardware level encapsulates each guest operating system in its own virtual machine, containing faults to a single environment. This helps increase reliability by limiting the propagation of faults, and allowing them to be handled by software, rather than hardware mechanisms. Likewise, because each virtual machine isolates its guest operating system and applications, any security flaw affecting one environment does not affect another.
- *Business continuity and backups.* With operating systems and applications encapsulated into disk files, they can be backed up as a complete unit, and they can be migrated to a secondary datacenter, ready to activate in the event of a failure at the primary location.

## Chapter 3

# VMware Infrastructure at Work

One of the easiest ways to see the business benefits of the combination of Sun x64 servers and VMware Infrastructure is to consider some examples of how it can be used. This chapter presents three such examples: server consolidation, business continuity, and hosted desktops.

## Server Consolidation

One of the most common reasons for IT organizations to deploy VMware Infrastructure is to consolidate a wide range of existing server platforms onto a smaller set of state-of-the-art servers. Virtually all datacenters host a wide range of servers, each set purchased because it was well-suited to a particular operating system or application at the time. Compared to today's technology, these systems are often slow and energy-inefficient. Applications whose components were deployed one per server now could be powered easily by a smaller number of modern servers, saving space, power, and cooling. Some organizations need to continue to run legacy applications on legacy operating systems (such as Microsoft Windows NT) but are faced with expired service contracts on hardware that cannot be replaced due to the lack of drivers for new hardware (such as USB).

VMware Infrastructure can support a heterogeneous environment including multiple instances of the Solaris 10 OS, and different instances and versions of Linux, FreeBSD, Novell Netware, and Microsoft Windows operating systems (Figure 2).

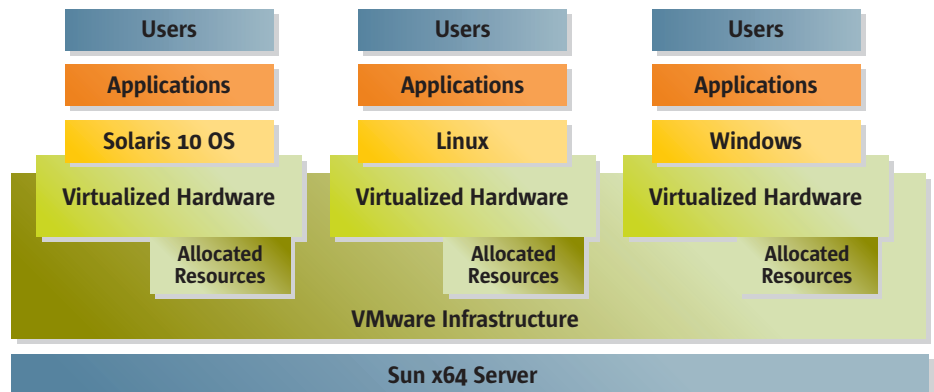


Figure 2. VMware Infrastructure allows IT organizations to support heterogeneous workloads all on the same, powerful, Sun x64 server.

VMware Infrastructure implements abstractions that provide each of these systems with the hardware they expect to see so, for example, a legacy operating system

such as Microsoft Windows NT can run in a virtual machine on a server with modern peripherals — interfaces that could not be accommodated by the operating system if run on the native hardware. VMware P2V Assistant software assists in the physical-to-virtual transition by creating and moving images from physical servers into virtual disks used by VMware Infrastructure.

## Business Continuity and Disaster Recovery

Server consolidation helps to increase application availability because economies of scale make it easier to use larger servers with improved reliability, availability, and serviceability over smaller ones. But failures ranging from a single server to an entire regional datacenter can bring a business to its knees. Fortunately, VMware Infrastructure provides straightforward solutions for both disaster recovery and business continuity.

### Managing Planned Downtime

Planned downtime is a regular occurrence in IT environments. Servers are replaced; components such as CPUs, memory, and disk are upgraded; and software is patched and updated. In typical environments, these events require system shutdowns that can result in application downtime. When applications are deployed in virtual machines, however, VMware VMotion supports live migration of an operating virtual machine from one physical server to another with no interruption in application availability. This allows running applications to be moved from a physical server requiring maintenance to other servers for the duration of the maintenance activity. With all workloads moved off a server, it then can be taken offline for maintenance, upgraded, or even replaced without affecting the availability of the applications that were running on it. Once the repair, upgrade, or replacement is complete, virtual machines can be moved back to the original server.

### Managing Unplanned Downtime

Unplanned downtime represents unpredictable risks for IT organizations. Contrary to its name, however, good planning can mitigate the impact of unplanned downtime. In an unplanned downtime scenario, the mission of the IT organization is to restart systems that have stopped running, and minimize data loss and application outages for users.

Disasters vary in scope: some may affect a server, rack, or portion of a datacenter, while others may take an entire geographic location offline.

- *Within a single datacenter.* Rapidly restarting a failed server is the primary concern when a disaster strikes a single server or portion of a datacenter. VMware High Availability (HA) constantly monitors the servers within a virtual infrastructure. In the event of an unexpected server failure, VMware HA automatically restarts the affected virtual machines on a separate, functioning

server in the virtual infrastructure. VMware HA is straightforward to use, and it can be configured to support a wide range of applications.

- *Beyond a single datacenter.* For larger disasters, such as those caused by power outages, floods, or earthquakes, IT organizations establish a site-to-site failover process. In this scenario, a primary operational site should be able to quickly and reliably restart operations at a recovery site with minimal data loss and downtime for users. The hardware independence supported by VMware Infrastructure allows virtual machines to operate on different hardware at a failover datacenter without the traditional requirement of having to exactly match hardware with operating systems, drivers, middleware, and application software. This not only reduces the time to bring up a failover site, it helps organizations to protect their investment in server infrastructure by allowing servers to be rotated into failover sites following a capital management strategy that best suits the organization.

VMware Site Recovery Manager accelerates helps implement a successful recovery by automating the process and eliminating the complexity of managing and testing recovery plans. VMware Site Recovery Manager helps to make disaster recovery speedy, reliable, and manageable so organizations can meet their recovery objectives. By virtually eliminating complex, manual recovery steps and supporting non-disruptive recovery plan testing, Site Recovery Manager helps to reduce the risk and worry over disaster recovery, helping to protect all of an organization's important systems and applications.

## Virtual Desktop Environments

For years, Sun and its customers have been able to significantly change their cost equation by centralizing their computing resources and accessing applications through Sun Ray™ ultra-thin clients. Sun Secure Global Desktop Software takes this concept a step further by providing access to server-based applications running on Windows Solaris, Linux, HP-UX, AIX, mainframe, and mid-range systems, making them available on an even more wide range of client platforms and devices. Sun Secure Global Desktop enables the truly mobile enterprise, allowing employees to access their enterprise and desktop applications at their desks using Sun Ray ultra-thin clients or full-featured desktop and laptop systems. Away from the office, they can access the same resources over the Internet using everything from thin clients to wireless devices and PDAs.

This architecture can leverage the economics of centrally managed, shared server resources while providing access to enterprise-critical applications. Using VMware Infrastructure, IT organizations can host application servers using supported operating systems in virtual environments on Sun x64 servers. Today, with the ability of VMware Infrastructure to support the Solaris 10 OS, even the Sun Secure Global Desktop software itself can be hosted in a virtual environment. This give the utmost in consolidation and flexibility by allowing all of the application server and access

server functions in Figure 3 to be hosted and resources managed through VMware Infrastructure.

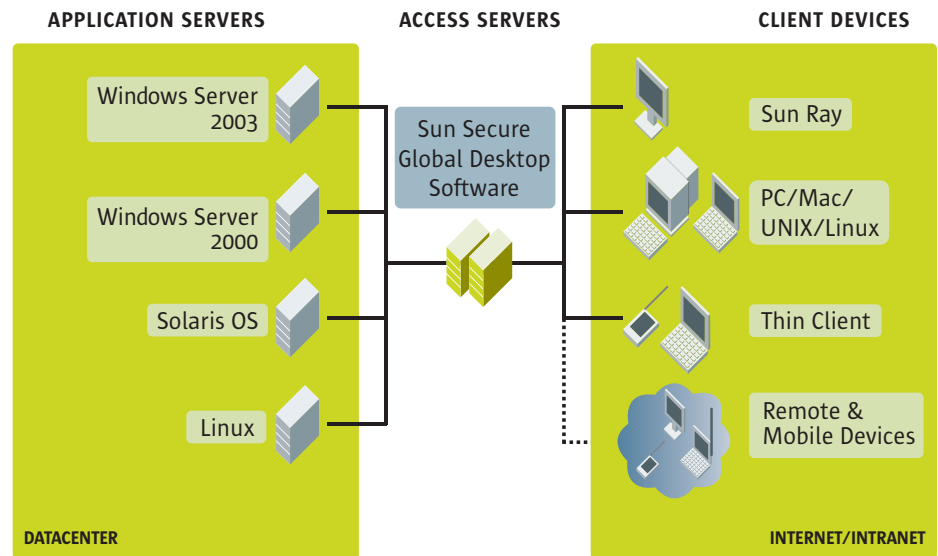


Figure 3. Using virtualization and Sun x64 servers, IT organizations can consolidate their application servers and provide employees with access from virtually anywhere — all within a virtualized environment.

## Chapter 4

# Summary

The combination of Sun x64 servers, VMware Infrastructure, and support for a variety of operating systems changes the equation for IT organizations and those who run them. VMware Infrastructure gives IT organizations the ability to quickly respond to rapidly-changing business conditions through the use of a virtualized datacenter that can adapt in real time. By consolidating multiple workloads from under-utilized servers onto a smaller number of space and power-efficient Sun x64 servers, they can help reduce their space, power, and cooling requirements. In addition, by choosing Sun x64 servers that include features such as redundant, hot-swappable power, cooling fans, and disk drives, they can help increase overall availability beyond what could be achieved with typical 1U servers configured without redundancy.

But that's not all. Moving to a virtualized environment and standardizing on a server platform gives IT organizations additional benefits that can help them to better manage their resources, including:

- Support for current and future applications and workloads
- Business continuity support for higher availability systems from rapid and automatic system restarts and or fail-over to secondary sites
- Freeing organizations from vendor-imposed upgrades for both hardware and software
- Providing support for legacy systems on modern, state-of-the-art servers
- Dynamic resource sharing that allows resources within servers and among pools of servers to be balanced and changed dynamically in response to changes in workload or business priorities
- Security and fault isolation that helps to increase availability
- Facilitating the use of pooled, centralized storage systems without the need to assign a unique and secure logical unit to each server or application
- Instant provisioning by copying 'golden master' installations of operating systems and patches
- Business continuity support through copying and migrating virtual disk images
- Maintenance with zero downtime through the ability to migrate running virtual machines to alternate platforms when a server must be powered off for maintenance

Sun and VMware is a virtually unbeatable combination of technologies for IT organizations wishing to break free from the legacy of individual functions and applications deployed onto individual servers with low utilization levels. You can see

a demonstration of VMware solutions at your nearest Sun Solution Center, where Sun helps take the guesswork and the risk out of implementing solutions.

### For More Information

Additional information is available from the following sources:

- For more information on Sun and VMware, please visit:  
<http://www.sun.com/vmware>
- For more information on Sun x64 servers, please visit <http://www.sun.com/x64>
- VMware's TCO and ROI Calculator is available at:  
<http://www.vmware.com/calculator>
- Sun and VMware Customer Success Stories can be found at:  
[http://www.sun.com/software/vmware/success\\_stories.jsp](http://www.sun.com/software/vmware/success_stories.jsp) and  
<http://www.vmware.com/partners/alliances/oem/sun-customers.html>
- Sun | VMware Solution Components are listed at:  
<http://www.vmware.com/partners/alliances/oem/sun-components.html>





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