Selecting a Virtualization Solution for Your Small or Midsize Business

TECHNICAL WHITE PAPER
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Introduction

Virtualization has transformed enterprise datacenters around the world, and is now drawing increased attention from small and midsize businesses (SMBs). The economics—hardware, facilities, power, cooling and more—are compelling, but SMBs struggle with different challenges and constraints than enterprises. The biggest difference is resources: With fewer staff and lower budgets, SMBs need better availability, reliability and security in their virtualization platforms. For example, the same resource constraints that make business outages extremely disruptive for SMBs keep them from implementing preventive measures, and make Business Continuity and Disaster Recovery among their highest priorities.

Of course, SMBs share many interests with their enterprise counterparts. They have the same Business Continuity requirements for high availability, failover, backup and security services, for example. And every size business wants to save money using virtualization’s higher consolidation ratios, lower administrative expense, more cost-effective use of storage, and power and cooling savings.

It’s often difficult for smaller businesses to evaluate competing virtualization platforms. Despite superficial similarities, different providers’ platforms are far from identical. Fundamentally different development goals, design philosophies, target markets, core and supporting technologies, feature sets, tools, bundles and support offerings have real consequences for implementation success—especially at smaller businesses with narrow margins of error.

This paper compares the VMware vSphere™ virtualization platform to two alternatives—Microsoft® Hyper-V™ Server and Citrix® XenServer®—focusing on features and issues that affect SMB outcomes.

The Right Start

SMBs count on employees or local partners to implement virtualization or expand their virtual footprint, so a proven, right-sized, well-supported solution is critical to their success. VMware vSphere Essentials and Acceleration Kits combine the right capabilities for smaller offices to use—not just test—virtualization.

Starting well under $100 per processor, VMware vSphere Essentials Kits help businesses cut hardware and operational costs through server consolidation with centralized provisioning, management and patching. VMware vSphere Essentials Plus Kits add Business Continuity features such as VMware® High Availability for dramatic improvements in application uptime, VMware Data Recovery with storage-efficient data deduplication, and VMware vMotion® live migration of running virtual machines.

Next-level VMware vSphere Acceleration Kits add scalability for growing businesses with enterprise-level manageability, dynamic load balancing and Business Continuity in complete, proven virtualization platforms. The Kits are sized right for small and midsize offices, and address their critical needs for application uptime and data protection.

1 Competitive product feature, specifications and price comparisons refer to VMware vSphere 4.1, Microsoft Hyper-V Server 2008 R2 and Citrix XenServer 5.6 except as noted, and reflect information available through public sources in December 2010.
## Selecting a Virtualization Solution for Your Small or Midsize Business

### VMware vSphere Kits and Editions Compared

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#### Product Components

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<td>Included Entitlement</td>
<td>3 servers with up to 2 processors each</td>
<td>3 servers with up to 2 processors each</td>
<td>8 Processors - scalable with additional licenses</td>
<td>6 Processors - scalable with additional licenses</td>
<td>6 Processors - scalable with additional licenses</td>
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<td>6</td>
<td>6</td>
<td>6</td>
<td>12</td>
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<td>4-way</td>
<td>4-way</td>
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#### Product Features

| Thin Provisioning     | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Update Manager        | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| vStorage APIs for Data Protection | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Data Recovery         | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| High Availability     | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| vMotion               | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Virtual Serial Port Concentrator | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Hot Add               | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| vShield Zones         | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Fault Tolerance       | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| vStorage APIs for Array Integration | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| vStorage APIs for Multipathing | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Storage vMotion       | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Distributed Resources Scheduler (DRS), Distributed Power Management (DPM) | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Storage I/O Control   | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Network I/O Control   | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Distributed Switch    | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Host Profiles         | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
“Free” solutions—like Hyper-V Server from Microsoft, XenServer from Citrix and VMware’s own free vSphere Hypervisor—are basic hypervisors appropriate for lab testing and evaluation. To build a real-world, manageable business solution, be sure your solution addresses the requirements of your business for:

- Business Continuity, so you keep data and services continuously available to the people who count on them, and quickly recoverable in case of loss.
- Central management, so your virtual environment works as a business solution, not a lab experiment.
- Scalability, so your IT infrastructure can support business growth and change—not constrain it.
- Economy, so you are considering consolidation ratios, maintenance and support costs, storage requirements, and power and cooling, in addition to software.

The following sections outline some of the capabilities today’s VMware vSphere brings your SMB with comparisons to leading alternatives.

**Fast, Flexible Management**

IT management challenges for SMBs don’t stop with deployment. Virtualization adds flexibility, but only if reconfiguration and expansion can be accomplished quickly and easily, with automated support wherever possible.

**Host Configuration**

VMware Host Profiles configuration management automatically applies “gold” network, storage and security settings to VMware ESXi™ hosts. Host Profiles automation cuts the time and expense of individual configuration and compliance checking, monitors compliance and remedies noncompliant hosts with the push of a button.

Microsoft Hyper-V R2 lacks any automated, out-of-box host profiling—configuration and remediation require Microsoft System Center Configuration Manager—a significant expense and a challenge to install and configure. XenServer’s host-pooling capabilities support sharing of storage and networking configuration settings, but not compliance checking or automated remediation.

**Adding Resources**

Applications sometimes need more resources than originally planned. VMware vSphere offers “hot-add” of virtual CPU or virtual memory and hot-add or extend of virtual disks to provision additional CPU, memory and disk resources to a virtual machine without disrupting the application or end users. Hot-add or extend of virtual disk is supported on all virtual machines; hot-add of virtual CPU/memory is supported for any guest operating system (OS) that supports it on physical servers.

Microsoft Hyper-V R2 and Citrix XenServer have no hot-add capability for virtual CPU or memory. They offer hot-add only—not hot-extend—for virtual disks, requiring running applications to recognize, accept and use a new drive letter instead of just adding capacity to an existing drive.

**Lower Risk**

Many SMBs put off virtualization out of concerns about risk. Risk takes two forms: the first includes individual risks like availability, continuity, downtime and data loss. But a bigger concern is project risk—whether virtualization is mature and reliable enough to trust with a running business.

**Trust at Scale**

Companies already trust VMware for efficient, reliable virtualization of business-critical workloads: More than 85 percent of ESX/ESXi deployments are in production environments. The “thin virtualization” form factor of VMware ESXi 4.1 has a compact code base—just 100MB of disk footprint—to maintain and secure. And with no dependence on a general-purpose server OS in the virtualization layer, ESXi 4.1 is immune from OS risks, threats and overhead.

In contrast, all versions of Microsoft Hyper-V R2 run Windows Server as the parent partition. The smallest available version of Hyper-V R2 has a disk footprint of about 3.6GB, more than thirty-six times the size of ESXi 4.1, with millions more lines of code to maintain and secure. The platform’s dependence on Windows perpetuates OS
scalability and security limits, especially when running multiple virtual machines on the same host. Citrix XenServer has similar difficulties: XenServer 5.6 relies on Linux running in the Domain 0 partition and has a disk footprint of about 1.8GB.

**Application Downtime and Data Loss**
VMware® Fault Tolerance (FT) keeps protected applications available even when hardware fails—continuous availability available elsewhere only with expensive specialized hardware. VMware FT creates shadow copies of applications’ virtual machines, then automatically triggers stateful failover if a virtual machine stops responding due to hardware failure. After failover, VMware FT creates a new shadow copy on another host to restore continuous protection. VMware FT works with all types of shared storage—Fibre Channel, network-attached storage (NAS) or iSCSI—and every OS. VMware ESX supports. It’s easy to set up and doesn’t require cluster-aware applications.

Microsoft offers no equivalent, proposing active-active clustering as an alternative. But that solution requires complex setup, and works with only a few cluster-aware applications. Third-party solutions for high availability of Windows applications in virtual environments are complex, expensive and an unrealistic alternative for most SMBs.

**Network Security Enforcement**
Virtualization creates value by breaking down datacenter silos. Enforcing security zones for virtual machines by segregating their physical hosts builds those same silos back up. Only the VMware vShield™ product family supports management of security zones in software, controlling network access to sensitive areas of the virtual datacenter—the external-facing “demilitarized zone” (DMZ), applications subject to Sarbanes-Oxley (SOX) compliance and so on—on an elastic, completely portable, virtual machine–by–virtual machine basis. This capability is critical to sharing resource computing pools, the basis of cloud computing. Neither Microsoft Hyper-V R2 nor Citrix XenServer has anything like it—Microsoft’s security best practices even recommend grouping virtual machines by security class on a single server: a security workaround that will rarely align with best business practices.

**Network Adaptor Failover and Load Balancing**
VMware vSphere builds network adaptor failover and load balancing into ESXi at the host level to assure hardware availability and fault tolerance in case a network adaptor fails. The approach works with any ESXi supported network adaptor, and uses teaming policies for simplicity when configuring multiple active and standby adaptors. Adaptor configurations can even vary across port groups located on the same virtual switch to balance the load across network adaptors.

Microsoft Hyper-V R2 offers no integrated network adaptor teaming; it relies instead on one-at-a-time configuration using third-party network adaptor drivers. These don’t work across third-party providers—each requires separate installation, leading to uncertainty when support issues arise. Citrix XenServer supports network adaptor teaming, but without any load balancing capabilities.

** Fewer Barriers and Exceptions**
SMBs don’t have the luxury of separate environments for operating systems and applications with different requirements. Pressures of time, cost, complexity and scale demand general-purpose solutions.

**OS Support**
VMware supports 65 guest operating systems, including the latest Windows and Linux distributions—more than either Microsoft Hyper-V or Citrix XenServer. Companies can virtualize current applications that require Windows, Linux, Solaris or Novell NetWare, and keep their OS options open for future applications.

Microsoft Hyper-V R2 supports 17 guest operating systems. Hyper-V support for new Linux capabilities trails Windows by months, and sometimes years. Microsoft’s understandable bias towards its own product restricts its customers’ ability to virtualize non-Windows applications today, and restricts customers’ applications choices tomorrow. Citrix XenServer supports 25 guest operating systems.
Application Support
VMware vSphere allows a virtual machine to use up to eight logical processors (8-way virtual SMP) and 255GB of RAM simultaneously, so companies can run processor-intensive databases and messaging servers, or their most memory-intensive workloads with no performance losses.

Microsoft Hyper-V R2 supports 4-way virtual SMP, but only for Windows Server 2008 and Windows 7 virtual machines—all others face 1- or 2-way virtual SMP limits. In addition, Hyper-V R2 supports only up to 64GB of RAM per virtual machine. These limitations combine to restrict the applications companies can virtualize. Citrix XenServer’s main limitation is that it supports only 32GB of RAM per virtual machine.

Advanced Capabilities
The most important SMB virtualization driver is datacenter consolidation. VMware virtualization delivers more than economic benefits, and forward-looking businesses are looking for new ways to create performance efficiencies, customer value and competitive advantage through innovations like cloud computing.

Virtual Networking
The VMware vNetwork Distributed Switch lets IT manage a single virtual switch across an entire cluster, instead of requiring a separate switch for each host. This new, time-saving way to manage virtual networks retains the network’s runtime state even when virtual machines move between hosts, and supports private clouds with central policy-based management of cluster-level network settings. Networking vendors have based virtual switches like Cisco’s Nexus 1000V on the VMware vNetwork Distributed Switch, helping to integrate virtualized environments and allowing management of physical and virtual networks with a single set of tools. For business customers, this means that environments that were not previously virtualized for security, DMZ or compliance reasons, can now be virtualized and centrally controlled.

Microsoft Hyper-V R2 offers nothing comparable to the VMware vNetwork Distributed Switch; it requires manual management of virtual networks on a host-by-host basis, including reconfiguration whenever a Hyper-V virtual machine migrates between hosts with incompatible virtual switch configurations. Citrix now includes support for an open-source version of a distributed switch, although it remains unproven and poorly integrated with XenServer.

Logical Resource Pools
New cluster-level management capabilities—VMware vNetwork Distributed Switch, VMware vShield Zones, VMware Distributed Power Management and more—plus performance and utilization optimizations and VMware Distributed Resource Scheduler (DRS) all raise the effectiveness and flexibility of VMware logical resource pools. VMware DRS, for example, moves lower priority virtual machines off the host so priority virtual machines get all the computing power they need as their workloads increase. The result is that resource pools aggregate and share resources across many servers—the essence of cloud computing. Companies can assign resource pools to individual business groups, guaranteeing both availability and isolation from other pools.

Microsoft PRO Tips and Citrix WLB have significant limitations in this area; neither supports true logical resource pools. PRO Tips’ intelligence depends on multiple third-party management packs, but offers no way to keep them from issuing conflicting recommendations. Neither solution is designed to divide a cluster of resources into logical resource pools—users of Hyper-V R2 or XenServer must instead dedicate physical clusters of hosts for each business group—exactly the time-consuming, expensive, rigid, siloed infrastructure virtualization is supposed to replace.

Savings
Cost reduction is the bottom line for most business virtualization decisions. Virtualization’s role in reducing hardware, facilities, management, power and cooling costs is well understood. But these savings are not necessarily equal across virtualization platforms. Businesses should look carefully to see how their candidates measure up on criteria like these:

Consolidation
Already the industry performance leader, the VMware vSphere 4.1 release significantly improves performance on all subsystems—CPU, memory, storage, networking and cluster utilization—for higher consolidation ratios than
any alternative. New Memory Compression improves memory utilization while delivering high performance; Storage and Network I/O Control meter traffic according to quality-of-service standards. The VMware advantage in performance and scalability allows greater consolidation and lower total cost, even compared to other vendors’ “free” offerings.

Microsoft Hyper-V R2 and Citrix XenServer lack high-performance “gang” scheduling, and memory management relies on ballooning alone. Lacking memory management functions like transparent page sharing and compression, a direct driver model, and logical resource pools with dynamic load balancing, their users must get by with lower virtual machine density and consequently higher costs for storage, server, network hardware, datacenter real estate, power, cooling and more.

Planned Maintenance
Scheduling planned maintenance during nonpeak hours wastes money for night and weekend overtime, time needed to schedule maintenance windows with business owners, and productivity and sales lost to downtime. VMware vMotion and VMware Storage vMotion let IT administrators perform planned maintenance during normal business hours, eliminating maintenance windows entirely. In its 4.1 release, VMware vSphere accelerates vMotion operations up to 10x over previous generations, and reconfigures Intel FlexMigration and AMD-V Extended Migration CPUs for vMotion compatibility with older CPUs without compromising performance. Because VMware vSphere supports up to eight concurrent vMotions per host, virtual machine evacuations are quick and maintenance can start earlier. Storage vMotion works across Fibre Channel, iSCSI, Network File System and direct-attached storage (DAS) devices.

Microsoft Hyper-V R2 has a CPU compatibility mode that works by effectively downgrading the Hyper-V cluster to 2005-era Pentium 4 CPUs. For storage migration, Hyper-V “Quick Storage Migration,” disrupts applications and creates application downtime. Both Hyper-V and XenServer support only one live migration at a time, introducing delays before maintenance operations can even start. XenServer has built-in live migration capabilities for virtual machines, but not storage.

Storage
VMware vStorage Thin Provisioning lets IT administrators create virtual machines without first provisioning storage. When virtual machines are created, their thin-provisioned disks consume only the storage they need, and grow as they need more. VMware vStorage Thin Provisioning includes consumption monitoring and alerts, so IT administrators know when to procure more storage or rebalance virtual machines across available storage using VMware Storage vMotion. VMware vStorage Thin Provisioning dramatically improves storage utilization, but automated monitoring and alerts are essential to avoid running out of storage.

Microsoft Hyper-V R2 offers thin provisioning of disks, but lacks the built-in monitoring and alerting that make it safe to use. Citrix XenServer supports thin disks, but for only a small set of storage area network (SAN) products.

Power and Cooling
VMware Distributed Power Management (DPM) cuts datacenter energy consumption by consolidating workloads within a cluster and turning off unneeded servers during nonpeak hours, for example at night. When the work day begins or utilization is expected to rise, it brings servers back online to meet service level agreements. VMware’s implementation of DPM is fully compatible with HP Integrated Lights-Out (iLO) and Intel Intelligent Platform Management Interface (IPMI) specifications for out-of-band host management to assure reliable server power management.

Microsoft Hyper-V R2 has nothing comparable: its PRO Tips–based solution can’t intelligently consolidate, power-off and then power-on a cluster of Hyper-V hosts based on application resource requirements. In fact, Microsoft’s R2 release uses core-parking for power management, powering down processor cores only, not entire servers. Paid versions of Citrix XenServer 5.6 include Advanced Power Management version 1.0, which performed inconsistently in laboratory tests due in part to its incomplete support for major out-of-band host management protocols.
Conclusions

With the release of vSphere 4.1, VMware has pushed the virtualization envelope in two directions. First, it has dramatically expanded the scalability of the platform to an unmatched number of virtual machines and virtualized hosts—extending the benefits of virtualization at even lower operational costs than ever before. Second, it has introduced capabilities for aggregating datacenter resources into an elastic pool of computing power for applications to use as they need, to keep utilization and service levels high.

For a small or midsize business, the operational simplicity of VMware vSphere 4.1 allows their system administrators to administer larger and more powerful virtual infrastructures, so their companies can achieve enterprise-grade results without enterprise-level investments. The scalability and utilization achievable with VMware vSphere 4.1 means greater value from virtualization investments: greater consolidation, less-frequent purchases of server and storage hardware and fewer expensive islands isolated by OS or application type. With the performance and management capabilities outlined above, and new VMware vSphere bundles sized and priced right for your business, VMware is the right choice to deliver the advantages of virtualization to your small or midsize business.
See Through “Free”

Every virtualization solution provider offers no-charge temporary, limited-use or defeatured versions of its virtualization software for potential customers to evaluate. And every provider charges competitive prices for permanent, unrestricted, full-featured production versions. Within those limits, providers arrange pricing and upgrade paths to reflect how their technologies fit together, show their products in the best possible light and earn returns for their investors. VMware prices its products for maximum transparency, to help you make an informed, realistic choice with no unpleasant surprises later on.

Compare Similar Solutions

When your business prices VMware and other virtualization solutions, it’s important to consider real alternatives. Measure VMware’s pricing against solutions that fit your production environment and business requirements—not against defeatured or incomplete solutions configured for price over utility. VMware provides detailed comparison data for you to review online, but these three families of VMware vSphere Kits cover most small and midsize business requirements:

• VMware vSphere Hypervisor—a single-server solution without centralized management for pilot, evaluation or lab testing.

• Essentials Kits—up to three one- or two-processor servers with centralized management, thin provisioning, update manager and APIs for data protection. The Essentials Plus Kit adds data recovery, high availability and vMotion migration of running virtual machines between hosts.

• Acceleration Kits—scalable Advanced, Midsize and Enterprise Plus Acceleration Kits add enterprise-class features like virtual security zones, fault tolerance, live migration of disk storage, resource scheduling and more, so you can scale your virtual infrastructure—with no artificial barriers or traps—as its value to your business grows.

Virtualization solutions need provisioning and central management to be effective in production environments—to stay effective, they need updates and backups. Select capabilities to match your business requirements, compare directly against any alternative and see how affordable the leading virtualization solution can be.

Consider All the Costs and Savings

From a financial perspective, virtualization is a capital investment that quickly and persistently reduces operational costs. This paper is full of ways VMware helps businesses cut their costs faster and deeper than alternative solutions. VMware deploys faster, uses less primary storage, permits higher consolidation ratios, reduces planned maintenance costs, saves storage space, cuts power and cooling, and more. Consider risks, and the case is even more compelling: VMware configurations expose your business to less downtime and data loss, allow better network security and more.

In head-to-head comparisons of complete, production-ready solutions, considering all the costs and benefits, VMware delivers unparalleled performance and value.