

5 SMB Virtualization Strategies

The server market just became more interesting for small and midsize businesses; new, cost-effective servers are giving SMBs access to functionality and benefits once available only to larger enterprises.

In fact, SMBs that have held off from virtualization projects now have even more compelling reasons to begin implementing their virtualization strategy. To maximize the virtualization's benefits, make sure you understand the key server characteristics that make them possible.

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For years, large enterprises have exploited virtualization to increase business agility, reduce capital expenditures and slash power and cooling costs. Yet smaller companies have largely missed out on these benefits, because servers with adequate support for virtualization's specialized workloads were beyond their IT budgets. But a new generation of Dell PowerEdge servers is changing the game, bringing the benefits of virtualization within SMBs' reach.

Table of Contents

One Application per Server: A Prescription for Trouble

Virtualization Saves the Day

5 Server Tactics for SMB Virtualization

SMB Virtualization Benefits

A Server Foundation Designed to Fit

About the Sponsors

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One Application per Server: A Prescription for Trouble

The traditional approach to computer and network infrastructures led to a tremendous amount of complexity and wasted computing resources. Typically, each major application (email, Web, collaboration, database and so on) received its own dedicated software and hardware. This single application/single server approach arose to ensure that each business requirement had adequate resources, performance and availability.

However, avoiding that problem created another: Server and storage capacities were grossly underutilized. According to Gartner, average server utilization in a corporate data center ran between 15 and 20 percent in 2010.[1] McKinsey pegged server utilization in many data centers at under 6 percent, while estimating that up to 30 percent of servers operate at even lower utilization rates.[2] In other words, companies with a 6 percent utilization rate pay for almost 17 times more capacity than they need.

Why not buy less capacity to better fit the workload? Part of the answer lies in peak demand. Computers are similar to energy, water and telephone utilities in this regard; if you plan only for the average amount of work, the system won't have the capacity to satisfy all needs when demand spikes. And peak demand periods are exactly when businesses can't afford an outage or any disruption of operations.

Virtualization Saves the Day

The problem of finding a balance between low utilization and accommodating periods of high demand led directly to virtualization. The true problem arose from the tight connection between workloads and physical hardware.

Virtualization breaks that bond with an additional layer of software that creates virtual machines, which allow applications to run without regard to specific physical machines. A virtual machine gives each application access to shared CPUs, memory and storage. It doesn't matter where the actual physical resources are; the virtualization software takes care of finding and allocating the available capacity and managing the resources.

A virtualized infrastructure turns a group of individual servers into a pool of shared resources. Applications can get what they need when they need it from any idle resources available in the pool, much as a person might occasionally borrow a cup of sugar from a neighbor.

As virtualization has matured and developed over the past 15 years or so, it has gained in business value and has become much easier to implement and manage — a key advance for smaller organizations that have limited staff and resources.

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During this maturation period, server hardware benefited from Moore's Law, an observation that the number of transistors that fit on an integrated circuit double roughly every two years. What that means more practically is that computing capacity and power have steadily increased while price per performance has decreased. For example, the latest generation of servers is designed to offer three to five times more processing and memory, as well as three to 10 times more internal storage and I/O, than servers offered a few years ago. These factors influence the number of virtual machines a single physical server can support.

In general, the more virtual machines per physical server, the greater the degree of utilization a company can achieve, boosting the benefits it can realize (although even a virtual environment requires some capacity headroom in case of a failover requirement or spikes in demand).

Companies that might not have benefited from virtualization in the past due to the expense of buying the necessary servers can now consider adopting the technology because the cost per unit of performance has dropped significantly — and more business computing tasks, such as sales transactions, databases lookups, financial analyses and customer management can be accomplished with fewer servers overall.

Five Server Tactics for SMB Virtualization

Getting the greatest benefit from virtualization involves plotting a careful course from the start. Consider these key factors when exploring a server foundation for virtualization.

1. Understand What Virtualization Requires

Virtualization poses a different set of demands on servers than was typical in the timeworn model of one server for each application. Servers need more processor power, memory, storage and I/O capacity to handle the needs of multiple virtual machines. To learn more about the specific virtualization demands, see A Server Foundation Designed to Fit on page 12.

2. Insist on an Open, Standard Architecture

Some vendors manufacture servers with proprietary CPUs, an approach that restricts hardware and software choices. Proprietary systems also typically require unique expertise to administer — even for basic maintenance tasks. Choosing machines that use standard x86 architecture reduces costs by eliminating the need for specialized personnel and costly experience while preserving future software and hardware options. Using standard chips at the heart of a system also means the vendor leverages a larger manufacturing base and thus, less costly products. Because vendor lock-in restricts business flexibility and limits strategic business choices, look for servers with a flexible and open architecture.

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3. Pay Attention to Operating System Options

Just as some vendors use proprietary chips, some also use proprietary operating systems, typically some form of Unix. Getting locked into a vendor's own brand of Unix limits choices in compatible hardware and applications — and it may mean higher prices for the operating system and other vendor software that you might need. Choose a server that supports a standard third-party operating system, such as Windows Server from Microsoft or one of the major distribution variations of Linux.

4. Check Virtualization Software Compatibility

Several companies (VMware, Microsoft, Red Hat and Novell, for example) make hypervisors, the technical name for virtualization software. Make sure any server you choose is compatible with all major hypervisors. Even if your business uses only one of them, hardware that's compatible with all preserves the option of changing to another hypervisor or integrating new systems from an acquisition or other business development.

5. Ensure Broad Hardware and Software Compatibility

Some servers lack the widespread popularity needed to gain support from third-party software and hardware manufacturers. Even if the server vendor can offer the entire range of additional products that you might need to properly manage the equipment, the lack of choice invokes the law of supply and demand, guaranteeing that your costs will be higher.

Growing businesses that build their infrastructure on the right server platform can reap virtualization's benefits — just as big companies have for years. Look for the performance that supports a greater number of virtual machines and compatibility with your existing infrastructure and the hardware and software you are considering for the future.

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SMB Virtualization Benefits

With Dell PowerEdge12th generation servers putting the powerful computing resources that virtualization requires in reach, SMBs can start exploring the benefits virtualization offers their businesses, including:

Flexibility. In traditional IT infrastructures, growth and expanding use of an existing application require an upgrade of memory, processor or the entire server, which means taking the machine out of service while the necessary changes happen. Adding a new application requires an additional server, a process that can take weeks when you consider ordering the hardware, installing and testing it, and bringing the equipment on line. But adding applications in a virtual environment is quick; instead of buying, configuring and installing a server, IT can create a new virtual machine in minutes. That speed allows businesses to react to changes in the market and business strategy at the optimal time.

Lower operational costs. Underutilization forces companies to spend much more for technical resources than they should. The situation is similar to hiring a fleet of trucks to deliver product, but loading each with only a few boxes and without coordinated routing. Intelligent routing could get all the deliveries made using only a fraction of the fuel, drivers and vehicle upkeep. Similarly, virtualization puts more capacity to use, allowing companies to get the same amount of work done with fewer servers and storage devices. Reducing the number of servers required saves money on hardware and some

software licenses and upgrades. When growing companies establish an efficient, up-to-date server foundation for virtualization, they benefit most from the ongoing operational savings that result from better availability, fewer repairs and simplified management.

Efficiency. In general, the more servers a company has, the more it spends on support for those servers. Not only does virtualization reduce the number of servers that need monitoring and maintenance, but it can allow personnel to more efficiently manage the remaining machines from a centralized management interface. Reducing the amount of administrative work required helps companies save on operational expenses. It also frees employee time for activities that can more directly support strategic directions, rather than having to maintain a mechanical status quo.

Reduced power and cooling. Fewer, more-efficient servers use significantly less power than more servers operating inefficiently. When an organization keeps adding servers, storage and additional network control devices, its server rooms or data centers eventually hit a breaking point. The server room or data center might lack the power capacity to run all the machines; the cooling facilities might struggle with the amount of heat the augmented number of servers generates; or the server room might run out of space for additional servers. Gartner estimates that virtualization and rationalization can lower annual energy by $400 per server per year.

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Improved availability and disaster recovery. When each application is associated with a physical server, problems can be devastating. If the hardware for a given software package ceases normal operations, the application becomes unavailable. To get it running again, IT must repair the machine or configure a new server and then install the appropriate software. Virtualization offers improved availability and disaster recovery because a new instance of the virtual machine can quickly run the package in question. Downtime is minimized, and work can continue.

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A Server Foundation Designed to Fit

Dell PowerEdge 12th generation servers offer features designed to support virtualization now and into the future.

Performance. Performance is a key attribute for servers in a virtualized environment. The better the inherent capabilities of the physical server, the more virtual machines it can run and the greater the virtualization benefits. The Intel® Xeon® processor E5 family provides Dell PowerEdge 12th generation servers with up to 80 percent better performance[3] than the previous generation. Greater computing capacity means that workloads on virtual machines can be more demanding for resources and still be able to coexist on the same physical server.

Memory, storage and scalable I/O. Memory is critical for virtualization because it can directly limit the number of virtual machines that can run on a given server. In Dell's 12th generation servers, PCI Express (PCIe) solid state drive (SSD) storage also lets the server access data five times faster, thanks to the inherent speed advantage that solid state storage has over conventional mechanical hard drives. And, the SSDs have a faster connection to the server, improving workload-specific performance and removing bottlenecks. A CacheCade RAID accelerator, Network Daughter Card (NDC) and switch-independent partitioning technologies also help speed access to data. Greater memory support, enhanced storage and scalable I/O come together to enable more virtual machines per physical server and more efficient workloads with greater efficiency.

PowerEdge Network Daughter Card. The NDC allows the new PowerEdge servers to support 1GB to 10GB network interconnects directly on the motherboard. No matter what the speed of your network, PowerEdge servers can connect, avoiding any need to replace existing equipment before you are ready. If your operations scale up, the latest Dell PowerEdge servers will scale along with you. You can choose the speed, brand and protocol of the network card, giving you unsurpassed performance flexibility.

Dell PowerEdge 12th generation servers provide the power small and midsize businesses need to begin leveraging the benefits of virtualization. Now SMBs can get the same advantages — increased business agility, reduced capital expenditures, and savings on power and cooling costs — that enterprises have enjoyed for years.

The Intel® Xeon® processor E5 family provides Dell PowerEdge 12th generation servers with up to 80 percent better performance3 than the previous generation.

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The Heart of Supercomputers: Powering Your Business

The Intel® Xeon® processor E5 family of processors brings unparalleled power to servers. With up to eight cores and 20 megabytes of cache, the Intel Xeon E5 processors provide the best combination of performance, built-in capabilities, and cost-effectiveness for a company's needs.

PCI Express 3.0 Support. The Intel Xeon processor E5 family is the first to support full integration of the PCI Express 3.0 specification, which improves I/O bandwidth by up to twice that of the PCIe 2.0 specification. PCIe 3.0 enables lower power and higher density server implementations.

Adaptive Performance. Intel® Turbo Boost Technology 2.0 provides computing power when it's needed, delivering up to two times more performance[4] upside than previous-generation turbo technology.

Speed I/O. Intel® Integrated I/O reduces I/O latency by up to 30 percent,[5] which helps eliminate data bottlenecks, streamline operations and increase business agility.

Automated Power Management. Dell OpenManage Power Center coupled with iDRAC7 Enterprise uses on board sensors for greater control over power and thermal levels across the system. Combined with Intel Node Manager, it can automatically manage and regulate power consumption at the server, rack, room or data center level, combining industry-leading energy efficiency with intelligent performance that adapts to your workload.

[1] Phil Sargeant; "Data Center Transformation: How Mature Is Your IT?"; February 2010; Gartner; http://www.gartner.com/it/content/1282000/1282013/data_centre_transformation_phil_sargeant_17feb2010.pdf

[2] James M. Kaplan, William Forrest and Noah Kindler; Revolutionizing Data Center Energy Efficiency; McKinsey & Company; July 2008; http://www.ecobaun.com/images/Revolutionizing_Data_Center_Efficiency.pdf

[3] Internal Intel performance comparison using geometric mean of SPECint*_rate_base2006, SPECfp*_rate_base2006, STREAM*_MP Triad, and Linpack* benchmark results. Baseline geometric mean score of 166.75 on prior-generation 2S Intel® Xeon® Processor X5690 platform based on best published SPECrate* scores to www.spec.org and best Intel internal measurements on STREAM*_MP Triad and Linpack as of Dec. 5, 2011. New geometric mean score of 306.74 based on Intel internal measured estimates using an Intel® Rose City platform with two Intel® Xeon® processor E5-2690, Turbo and EIST Enabled, with Hyper-Threading, 128 GB RAM, Red Hat* Enterprise Linux Server 6.1 beta for x86_6, Intel® Compiler 12.1, THP disabled for SPECfp_rate_base2006 and enabled for SPECint*_rate_base2006.

[4] Internal Intel performance comparison using SPECint*_rate_base2006 benchmark with turbo enabled and disabled. Baseline scores of 393 (turbo enabled) and 376 (turbo disabled) based on Intel internal measured estimates as of Dec. 5, 2011, using a Supermicro* X8DTN+ system with two Intel® Xeon® processor X5690, Turbo Enabled or Disabled, EIST Enabled, Hyper-Threading Enabled, 48 GB RAM, Intel® Compiler 12.0, Red Hat* Enterprise Linux Server 6.1 beta for x86_6. New scores of 659 (turbo enabled) and 594 (turbo disabled) based on Intel internal measured estimates using an Intel® Rose City platform with two Intel® Xeon® processor E5-2680, Turbo Enabled or Disabled, EIST Enabled, Hyper-Threading Enabled, 64 GB RAM, Intel® Compiler 12.1, Red Hat* Enterprise Linux Server 6.1 beta for x86_6.

[5] Claim of up to 5.9x better performance on business applications is based on the results of a performance study conducted by Principled Technologies comparing a 1S server based on the Intel® Xeon® processor E3-1240 to a 1S server based on an Intel® Core™ 2 Duo Processor E6400 on three SMB workloads: email, database and Web. The averaged normalized performance of the three workloads on the server based on the Intel® Xeon® processor E3-1280 is 5.9x better than the desktop-based server. Software and workloads used in performance tests may have been optimized for performance only on Intel microprocessors. Performance tests, such as SYSmark and MobileMark, are measured using specific computer systems, components, software, operations and functions. Any change to any of those factors may cause the results to vary. You should consult other information and performance tests to assist you in fully evaluating your contemplated purchases, including the performance of that product when combined with other products. For the full report, including configuration details, please visit http://www.principledtechnologies.com/clients/reports/Intel/E3-1240_SMB_Performance.pdf For more information go to http://www.intel.com/performance.

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