

Turn Your Data Center Green—Cost-Effectively

Server and Storage Virtualization Address Today's Toughest Challenges

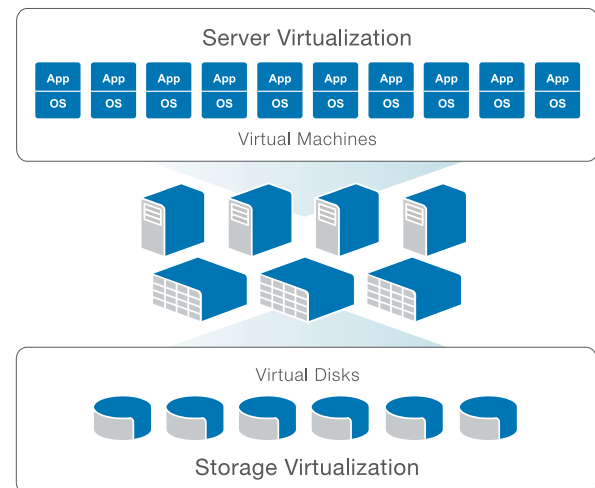
Data center energy consumption has become a major issue for many businesses, adding substantially to operating costs and creating roadblocks to growth in existing facilities.¹ Fortunately, a powerful solution is available today. By combining server and storage virtualization, companies can dramatically reduce not only energy consumption, but also space requirements, equipment costs, and overall operating expenditures. These technologies can add years of life to existing facilities, while providing unprecedented flexibility for supporting new applications and growing workloads.

INTEL AND COMPELLENT— VIRTUALIZING THE DATA CENTER

In combination, server and storage virtualization offer much-needed relief for today's overloaded data centers.

- **Lower total costs**—Capacity is used far more efficiently, which reduces capital costs and data center footprints, as well as power and cooling requirements.
- **Simpler provisioning and management**—Virtual servers and storage volumes can be created in minutes, and resources can be dynamically allocated as workloads evolve. Many time-consuming tasks can also be automated, enabling fewer administrators to manage more systems and larger data volumes.
- **Improved availability**—A failed application can be restored in seconds—including complete data recovery. High availability and disaster recovery can be implemented quickly and cost effectively, without extensive design efforts or dedicated hardware.

Many businesses are already taking advantage of server virtualization on multi-core Intel® Xeon® processor-based servers to consolidate dozens of applications per server. Storage virtualization offers comparable advantages. A Compellent Storage Center* SAN, which is also powered by Intel® Xeon® Processors, can help many organizations reduce storage-related power consumption and space requirements dramatically, often by more than 90 percent, while greatly simplifying data and storage management.



Virtualization makes the data center more agile and efficient by transforming each physical server and storage unit into a virtual pool of resources that can be shared easily across any number of applications.

STORAGE VIRTUALIZATION

Why you need it and how it works

Storage resources are heavily fragmented and underutilized in most data centers. This is especially true for traditional server solutions, with their direct-attached hard drives. Yet over-provisioning is also a fact of life in most storage area network (SAN) environments. Unless the SAN supports virtualization, each application must be provisioned with enough dedicated physical storage to accommodate growing and unpredictable workloads. As a result, typical SAN storage utilization is only about 25 percent²

With its virtualized SAN solution, Compellent eliminates this massive waste. Two features are particularly important.

1. Thin Provisioning reduces the number of required disk drives up to 75 percent.

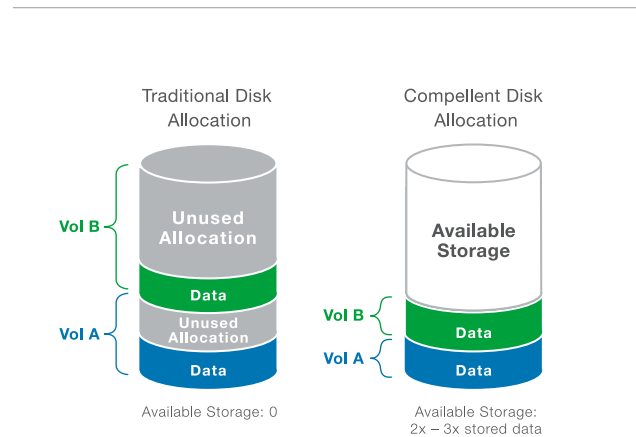
With thin provisioning, storage capacity is allocated to individual applications only when data is written to disk. Each application uses only the storage it requires, and all extra capacity exists as a single resource pool that is dynamically allocated as application requirements grow. Organizations can purchase just the capacity they need, use it efficiently, and add physical disk capacity incrementally and without disruption as requirements increase.

2. Multi-tiered storage further reduces capital costs and power consumption.

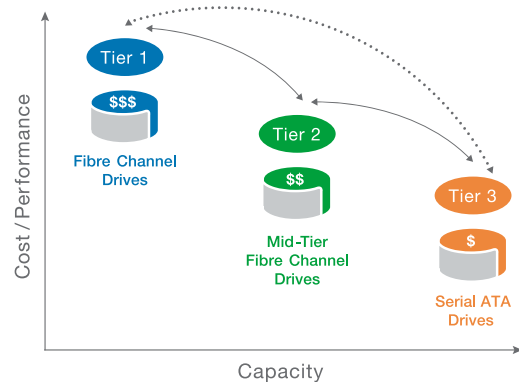
According to industry analysts, 80 percent of data within a typical storage volume is inactive (old e-mails, rarely accessed database tables, etc.) Yet this inactive data is typically stored on expensive, high-speed drives, simply because there is no cost-effective way to separate inactive data from active data that requires high-end performance.

With a Compellent SAN, data usage is monitored at the block level. Active data can be stored on high-performance disks, while inactive data within the same volume can be stored on less expensive and more energy-efficient disks. This is done automatically without time-consuming data classification or manual data migration.

To appreciate the benefits, consider a typical enterprise SAN. Instead of populating the entire SAN with 15,000 RPM, 300 GB Fibre Channel drives; 80 percent of the SAN can be populated with 7,200 RPM, 1TB SATA drives. Organizations can deploy far more disk capacity at less cost, without negatively impacting service levels; with little or no management overhead; and with less draw on data center space, power and cooling resources.³



Thin provisioning eliminates the need to over-provision storage for individual applications, which can free up to 75 percent of SAN capacity for active use.



Multi-tiered storage enables organizations to purchase more disk capacity at less cost, and to reduce space and power requirements.

SERVER VIRTUALIZATION

Unleashing the power (and efficiency) of multi-core processors

As with storage virtualization, server virtualization enables dramatic increases in system utilization—from less than 10 percent, which is typical in traditional one-application-per-server deployment models, to virtually any level that meets IT headroom requirements. Server virtualization also enables organizations to realize the full benefits of multi-core processors, by enabling CPU resources to be distributed efficiently across multiple operating systems and applications.

The benefits are compelling. A recent study found that the latest Quad-Core Intel® Xeon® processors deliver nearly five times the performance per Watt of today's widely deployed servers based on single-core Intel® Xeon® processors.⁴ Combined with the superior utilization enabled by virtualization, this can deliver order-of-magnitude gains in usable computing performance per watt—and per square foot.

BETTER TOGETHER

Simplifying and automating the data center

Compellent's virtualized SAN solution not only improves storage utilization, but also extends the benefits of server virtualization. Since Compellent provides Boot-from-SAN capabilities, there is no need for local disk storage on individual servers.⁵ Diskless rack or blade servers can be used, which increases density; saves on hardware, power and cooling costs; and largely eliminates the need for inefficient, dedicated storage.

With this approach, physical server and storage resources can be scaled independently. Provisioning is quick and simple, and high-availability can be configured quickly and at very low cost, through automated system snapshots and data replication. If a virtual server fails for any reason, a new server can be provisioned and data restored in a matter of seconds, either on the same physical server, on a nearby system for even higher availability, or on a remote system for disaster recovery.

These capabilities provide a major leap forward in data center efficiency. Today's brittle and fragmented server and storage solutions are transformed into on-demand resource pools that are more flexible, resilient and efficient. Perhaps most importantly, power, cooling and space requirements are dramatically reduced. This value is multiplied even further, since the reduced cooling requirements also reduce power requirements for the air conditioning infrastructure. Monthly costs are decreased accordingly, and a previously overtaxed data center is freed to support rapid, ongoing growth.

THREE COMPONENTS TO TRANSFORM YOUR DATA CENTER

Quad-Core Intel® Xeon® processor-based servers and storage

- » Four cores per processor for high-density consolidation
- » Breakthrough performance per core with Intel® Core™ microarchitecture
- » Outstanding power efficiency and built-in virtualization support

A COMPELLENT VIRTUALIZED SAN

- » 75 percent lower disk requirements with Thin Provisioning
- » Additional savings through Automated Tiered Storage
- » High availability at low cost with Boot-from-SAN, snapshots and data replication

INTEL® STORAGE BUILDING BLOCKS

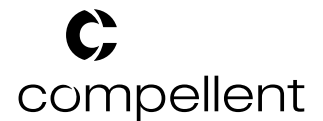
Driving standards-based storage solutions

Just a few years ago, advanced SAN solutions were far beyond the reach of most organizations, largely because industry-leading storage capabilities required proprietary hardware architectures that were costly to design and build. Intel has helped transform the storage industry, by providing standards-based storage building blocks that deliver leading performance and functionality at reduced cost. This frees storage vendors to focus on the kind of advanced software functionality that is driving rapid improvements in end user value—as embodied in Compellent's SAN virtualization and management applications.

Intel storage building blocks include:

- » Intel® Xeon® processors, which deliver scalable, energy-efficient performance, while supporting flexible configurations and simplified system management.
- » Standards-based storage solutions that provide high-performance and rich functionality (data protection, manageability, and more) in dependable, high-density designs.

Intel is working continuously with the storage community to drive new standards that enable faster and more cost-effective delivery of new technologies. Look for storage systems based on Intel® Architecture Processors to ensure reliable systems that provide you with significant gains in performance, efficiency and value.



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1. "Gartner surveys confirm that, by 2008, at least 50% of legacy data centers will be functionally obsolete in terms of power, cooling and space capacity." Source: IT Operations and Corporate Facilities Can Seek Conflict or Collaboration, by Michael A. Bell, March 9, 2007, Gartner, Inc., ID Number: G00146558.
 2. Source: GlassHouse Technologies, Inc.
 3. Using SATA drives in place of high-speed Fibre Channel drives can reduce cost, space and power consumption by as much as 80 to 90 percent.
 4. Based on SPECint per Watt measurements performed by CERN, the European Laboratory for Nuclear Research. For more information, see the CERN white paper: Strategies for Increasing Data Center Power Efficiency; An overview of CERN's approach to energy-efficient computing. www.energystar.gov/ia/partners/prod_development/downloads/EPA_Datacenter_Report_Congress_Final1.pdf.
 5. Compellent provides a Server Instant Replay* feature that enables a single boot volume to be used across any number of virtual or physical servers (a pointer is created for each server, which contains all the server-specific information, such as its name and IP address). This substantially reduces storage requirement and simplifies maintenance of the boot image.

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