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## Using Software to Reduce Power Consumption

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# Using Software to Reduce Power Consumption

## Overview

Business demands on IT are ever-increasing to keep pace with the exponential growth of data throughput and the fast-rising need for data storage. Data centers are struggling to deploy the servers and storage hardware needed to meet the expanding demands of this business environment.

The growth in data center hardware requirements brings with it a steady increase in the amount of power needed. Higher density, achieved through miniaturization, has also contributed to increased power and cooling requirements for the physical data center space.

Data centers are running out of power even as governmental environmental regulations are increasing and cost per watt is rising. Incremental power—when it is available—is even more expensive. Consequently, a growing number of companies are using data asset management software strategies to help better manage growth, and they are finding that these strategies can also reduce hardware power consumption and cooling needs.

Several of the data management technologies that IT administrators have used for years in their server and storage environments are also proving to be compelling tools for getting more out of hardware. These include:

- Clustering
- Storage tiering
- Thin provisioning
- Data deduplication
- Virtualization
- Storage resource management
- Power management
- Efficient data center design

These technologies are the components of a cost-effective strategy for making the most of IT investments while also maximizing business continuity.

## Powering up

The power and cooling challenges that data centers face are very real. In a November 2006 Gartner study, 50 percent of data centers reported that they will have insufficient power and cooling capacity by 2008.

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Power is not cheap—nor is it getting any cheaper. For example, cost per watt in the United Kingdom increased by 35 percent just from 2005 to 2006. During the same period, the European Union dealt with a 15 percent cost-per-watt increase.

What's more, data centers use a lot of power. In the United States, server power consumption alone totaled 45 billion kilowatt hours in 2005—more than the total power requirements of Mississippi and 19 other states, according to a Lawrence Berkeley National Laboratory study.<sup>1</sup> The world's server power consumption for 2005 totaled 123 billion kilowatt-hours, and total IT power consumption added up to four percent of the world's energy usage.

With data centers demanding more and more power, costs can soon skyrocket. In fact, a recent *Business Week* article found that large organizations spent between four and eight percent—and sometimes as much as 10 percent—of their IT budgets on energy. Gartner has predicted this expense will be up to four times greater within the next five years.

Government regulations are putting additional pressure on data centers to become more energy-efficient. Regulations such as Japan's Energy Law and the European Union's Directive for Energy-using Products (EuP) have companies around the globe looking for effective strategies to address these challenges. In the United States, businesses are seeing increased scrutiny by the Environmental Protection Agency in dealing with the U.S. Supreme Court ruling that carbon dioxide and other greenhouse gases are now considered air pollutants under the Clean Air Act.

To address these issues, companies are utilizing low power servers and standby power management software. As a result, their power supply efficiency is improving. Many businesses are also leveraging virtualization to address a small portion of the problem. Indeed, using more energy-efficient servers is an effective approach to energy conservation.

Yet, as enterprises buy these servers, they are faced with another challenge: lowering energy consumption with a mix of current and new hardware without compromising service-level agreements (SLAs).

And that is where the good news begins. By using software that enables them to improve hardware utilization and store data more efficiently, enterprises can both create energy efficiencies in the data center and meet established response time levels.

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<sup>1</sup> Stephen Shankland, "U.S. servers slurp more power than Mississippi," cnetnews.com, <http://hightech.lbl.gov/media/CNET-14Feb07.pdf>

### **Clustering**

The usual reason for deploying clustering technologies is to reduce application downtime. But application protection is only one benefit of clustering, and not all clustering tools offer the same capabilities. Most clustering solutions require identical hardware and operating-system environments. Because organizations must also ensure platform parity in a cluster, this solution can be expensive and restrictive.

However, clustering solutions are now available that can support a variety of operating systems—from UNIX to Windows®, Linux®, and virtual platforms—as well as a wide range of heterogeneous hardware configurations. With these tools, IT can maximize resource utilization by consolidating workloads running on under-utilized hardware onto a smaller number of machines.

In addition, while many clustering products and deployments are pairs of active-passive nodes in a high-availability cluster, solutions have emerged that support N+1 clustering. Combined with workload management, resilience, and advanced failover logic, use of these solutions in an N+1 configuration preserves availability while reducing power draw, increasing utilization, and reducing the number of servers required to support the applications.

### **Storage tiering**

The key to deriving value from multiple tiers of storage is to place each file on the appropriate type of storage device based on a number of criteria, including its availability and performance requirements, as well as protection and other business needs. Today, enterprises can exploit different storage components, configurations, and capabilities to create tiers of storage that match cost with data value and I/O performance with data access needs, while meeting business application requirements for availability and security.

Storage tiering has an ancillary benefit: Many organizations discover that clearly matching data with appropriate storage also reduces the required amount of physical storage hardware. Moreover, as data ages over time or undergoes cyclical variations, a relatively small portion of an organization's files are considered critical. These files can be placed on lower-capacity, higher-performing devices. The bulk of the organization's data, which is considered non-mission-critical, can then be placed on higher-capacity, lower-performing devices. Since a 1 TB lower-performance drive takes up the same amount of physical space as a high-performance 70 GB drive, fewer devices overall are required for storing data.

A more economical solution may be to leverage MAID (massive array of inactive disks) technology, which consumes a small fraction of the electrical power used by lower-performance storage systems that house non-transactional data. MAID storage subsystems power-off idle

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disks and power them back on when an application needs access to dormant data. This gives enterprises a third energy-efficient data storage tier for migrating data.

Furthermore, organizations with dynamic storage tiering capabilities enjoy additional efficiencies. Dynamic storage tiering enables IT to utilize the appropriate tier of storage for the applications without affecting their availability to the business.

With storage tiering, information is automatically moved non-disruptively to less expensive storage based on the changing value of the information. IT defines the policies that move the files, and the policies shift the files dynamically to higher or lower tiers of storage based on the defined criteria, eliminating administrative overhead.

### **Thin provisioning**

Allocating storage to an application based on long-term requirements can provide capacity for uninterrupted growth, but at a price. Storage that is allocated but not used by an application still consumes power. Thin provisioning provides an answer to this issue. With thin provisioning, the volume is allocated based on long-term application requirements; however, storage is allocated to that volume as it is being used (when data is written). This both optimizes power and helps ensure that the application can grow automatically as data needs increase.

### **Data deduplication**

Perhaps one of the most overlooked strategies for reducing hardware requirements is to decrease the overhead associated with holding multiple data copies by identifying common data and reducing copies to a single entity. This technology, often referred to as data deduplication or single-instance storage, can have a dramatic impact—in some cases, reducing data by 98 percent—on the amount of disk storage required for archiving purposes as well as the number of tapes and tape drives required for backup purposes.

Deduplication is commonly used in messaging applications. For example, if an attachment was sent to 100 people, it would be stored only once, thus saving the disk space that would have been required to store the other 99 copies.

### **Virtualization**

Server virtualization optimizes hardware usage by allowing for better distribution of processing loads across server hardware. Having the appropriate software infrastructure for server virtualization allows this technology to be extended into enterprise-level applications. In addition, virtualization infrastructures are now becoming available that provide the I/O performance required for I/O-intensive applications.

In acknowledgment of the benefits that can be realized through server consolidation, IT managers are also exploring storage virtualization. Storage virtualization helps ease the hardware utilization challenge by enabling administrators to pool all storage into logical groups that can be re-allocated quickly or even in real time based on demand. The best virtualization software can do this across any storage array from a variety of vendors, running under a variety of operating systems—and from a single management interface.

When storage resources are virtualized, they appear as a single resource. Data can be moved transparently across vendors and operating systems to utilize available capacity. Storage management tools also enable IT to classify data by age or type so that less valuable or less current data can be moved automatically to higher-capacity, less-costly storage.

### **Storage resource management**

A large percentage of the data contained on the majority of storage devices is of little or no immediate business value. But simply reviewing overall disk capacity usage does not give IT administrators this information. Indeed, a disk array may very well be full, making it appear as though storage is at 70 or 80 percent of capacity, when in reality the majority of files on the disk are old, rarely accessed, or non-business related.

The challenge, then, is to better manage where and how critical and non-critical information is stored. This requires visibility into both current and historical disk usage. To maximize storage assets, IT must be able to accurately track the availability and usage of resources and make the necessary adjustments based on such information.

Using storage resource management tools with discovery, visualization, and reporting capabilities, IT can reclaim lost or wasted storage and more accurately forecast current and future storage capacity. Additionally, any unused or orphaned storage can be identified for optimal usage.

Familiar technologies that have proven effective in their server and storage environments can also help IT to realize fundamental cost efficiencies through improved resource utilization. Workload consolidation, storage tiering, the elimination of duplicate data, server and storage

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resource virtualization, and the reclamation of lost or wasted storage enable IT organizations to improve the efficiency of existing data centers and to maximize their current hardware infrastructure.

### **Power management**

In the typical business, computers are used an average of only four hours each business day. Yet, even when they are idle, they continue to use energy. Nearly 40 percent of the power consumed by IT equipment is used outside the data center—by desktops and their ancillary equipment.

Experts estimate that approximately 65 percent of energy used by computers and monitors is actually wasted because they are often simply not turned off when employees leave for the evening. Meanwhile, nearly half of monitors are not properly set up for power management, thereby missing an opportunity to save money and energy.

However, utilities are now available that enable systems administrators to quickly and easily govern and monitor the power management—or sleep—capabilities of all the desktop and system monitors throughout the corporate environment. With these capabilities integrated into their systems management infrastructure, IT can designate monitor shutdown policies at selected intervals and administer them from a single Web-based management console.

By some estimates, these toolkits can save an organization between US\$10 and US\$50 per PC annually, while also helping to address environmental responsibility objectives.

### **Efficient data center designs**

Companies around the globe are realizing that the lack of data center space and appropriate power and cooling facilities is beginning to hinder deployment of business-critical IT projects. Worse yet, for many, this problem is likely to worsen over the next year.

As a result, a growing number of organizations are working with data center design consultants whose concerted project approach to layout can deliver not only a significant space gain for an existing site, but measurable power and cooling benefits as well.

Among their other activities, these consultants can provide a rapid assessment of how much power is being used to cool unused, redundant, or over-specified systems. They can also evaluate current utilization to help the organization eliminate old or duplicate equipment and get one step ahead in the challenge of becoming more energy-efficient.

As costs rise and data centers inch toward full capacity and power and cooling requirements, organizations must begin addressing energy challenges now. The challenges will likely only become more difficult over time.

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These tactics and technologies described here can enable IT to decrease costs, simplify IT operations, reduce data center complexity, and optimize energy use.

### **How Symantec can help**

Symantec is a global leader in providing security, storage, and systems management solutions to help businesses and consumers secure and manage their information. Through effective software management of IT hardware, our solutions can provide cost savings through hardware capacity optimization and the resulting reduction of energy requirements. Symantec solutions for hardware management are operating-system and platform independent.

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Symantec products help IT organizations to meet green requirements in the following areas:

IT Functional Area	Features	Symantec Products
Application servers	<ul style="list-style-type: none"><li>• Optimized high availability</li><li>• Virtualization integration</li></ul>	<ul style="list-style-type: none"><li>• Altiris™ Total Management Suite</li><li>• Altiris™ Client Management Suite with the Altiris Energy Saver Toolkit</li><li>• Veritas™ Cluster Server</li><li>• Veritas™ Cluster Server One</li><li>• Veritas™ Virtual Infrastructure</li></ul>
Storage systems	<ul style="list-style-type: none"><li>• Dynamic and static storage tiering</li><li>• Performance measurement</li><li>• Thin provisioning</li></ul>	<ul style="list-style-type: none"><li>• Veritas Storage Foundation™</li><li>• Veritas CommandCentral™ Storage</li></ul>
Backup	<ul style="list-style-type: none"><li>• Data deduplication</li></ul>	<ul style="list-style-type: none"><li>• Veritas NetBackup PureDisk™</li><li>• Veritas NetBackup™</li><li>• Symantec Backup Exec™</li></ul>
Archiving	<ul style="list-style-type: none"><li>• Storage management</li><li>• Data deduplication</li></ul>	<ul style="list-style-type: none"><li>• Symantec Enterprise Vault™</li></ul>
Endpoints	<ul style="list-style-type: none"><li>• Power management</li></ul>	<ul style="list-style-type: none"><li>• Altiris™ Total Management Suite</li><li>• Altiris™ Client Management Suite with the Altiris Energy Saver Toolkit</li></ul>

Symantec Consulting services can help strategize and implement green IT initiatives in organizations through Data Center Consolidation and Storage Optimization Services.

### Conclusion

Storage software that optimizes power consumption can play a vital role in optimizing power for IT organizations. Storage power requirements can be minimized through the proper use of storage tiering, data deduplication, thin provisioning, and storage resource management. Server software provides reduced-power high availability as well as optimized performance and space utilization with virtualization. Idle workstations can be put into standby mode, dramatically reducing their power consumption. Long-term planning for the execution of these strategies and the optimization of space and power considerations through consulting provides the continuity required for organizations. Software can therefore play a significant role in the execution of green IT.

### **Green IT planning—questions to consider**

- Where does green IT sit on your agenda for 2008/2009 and beyond?
- Which aspects of green are you concentrating on?
- Is power consumption the “root of all evil”?
- Who do you consider to be the leaders in green (brands)?
- Who do you consider to be the leaders in green IT (brands)?
- Who do you consider to be the leaders in implementing green IT (suppliers, partners, etc.)?
- Who do you consider to have leading technology to help deliver green IT?
- Are you looking at hardware AND software solutions to make you more green?  
Are they both equally important?
- Which of the technology angles outlined in this briefing paper resonate with you?  
Which do not? Why?
- What other areas or technologies are missing?
- Would you physically move your data center in order to make it greener?
- Who is responsible for the utility costs of the data center?

**About Symantec** Symantec is a global leader in providing security, storage, and systems management solutions to help businesses and consumers secure and manage their information. Headquartered in Cupertino, Calif., Symantec has operations in more than 40 countries. More information is available at [www.symantec.com](http://www.symantec.com).

For specific country offices and contact numbers, please visit our Web site. For product information in the U.S., call toll-free 1 (800) 745 6054.

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