Symantec Energy Efficient IT

Case Studies

- by -

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Why You Should Read This Paper

Gartner Group has identified IT power and cooling as the highest priority issue facing IT organizations worldwide. It is a serious and exacerbating problem. Gartner is presently advising IT organisations to focus on reducing IT power and cooling because of:

- Power unit cost increases well in excess of inflationary increases
- Double-digit annual growth in Data Center power consumption
- Data Centers running out of power and cooling capacity
- Internal and external CO2 emissions reduction pressures consequent to International Panel on Climate Change (IPCC) Reporting.
- Unnoticed and unreported desktops and endpoints can often consume up to 40% of IT's total power bill while placing an increasing load on office environmental management systems, such as air conditioning.

Used as part of a holistic IT Greening approach, Symantec's server and storage management software products are uniquely capable of helping reduce Data Center power consumption and consequent CO2 footprints, while increasing power and cooling efficiency. Symantec's endpoint management products can also reduce desktop power consumption through intelligent power management. Symantec has a skilled services organization that can help IT organizations implement these products effectively.

Executive Summary

IT power and cooling challenges are a chronic, inescapable fact for many enterprises. While server virtualization will provide some relief, it will usually prove temporary. In the final analysis, it is important to recognize that while hardware produces power and cooling challenges, software is a critical ingredient in its mitigation.

Very little attention is paid to the desktop, which may consume as much power as the traditional data center.

Symantec provides a range of software products that enable enterprises to significantly reduce their energy requirements throughout the entire IT infrastructure. These products work with existing hardware and can assist enterprises to plan for and optimize new hardware as it arrives; consequently, enterprises can begin to address power and cooling challenges immediately, because Symantec's solutions do not require a capital investment cycle.

This paper details customer case studies which demonstrate the effect that Symantec's Data Center Management and Endpoint Management products can have on reducing the amount of power and cooling generated by IT equipment.

Contents

Introduction

Symantec Software Solution Overview

From a task-based perspective, associated Symantec product solutions are:

Energy Efficient Storage

Backup and Archiving Management

- NetBackup, Pure Disk, and Data De-duplication.
- Enterprise Vault and Backup Exec's Single Instance Storage.

Storage Management

- Command Central Storage..
- VERITAS Storage Foundation.
- VERITAS Storage Foundation Copy Services.
- VERITAS Storage Foundation Dynamic Storage Tiering.

Energy Efficient Servers

Server Management

- VERITAS Cluster System N+1 Clustering.
- VERITAS Application Director.
- Altiris, policy based server power management.

Workstation Management

- Altirs can also play a role in reducing the power consumption of desktop systems by providing intelligent power management services.

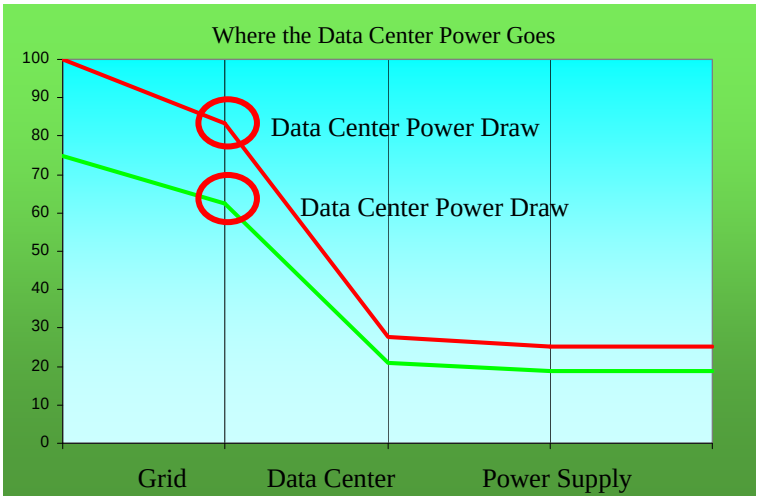
Energy Efficient Applications

Managing Application Performance

- Command Central Storage.
- Storage Foundation Database Editions.
- i^3.
- Storage Foundation.

How efficient is your Data Center? (Quantifying the returns)

To quantify the power, cooling and environmental benefits of any Data Center power reduction program, one must know how much energy that Data Center consumes. Lights, chillers, Uninterruptible Power Supplies (UPSs) and other Data Center equipment consume power; some equipment is more efficient than others and can play a key part in overall efficiency.

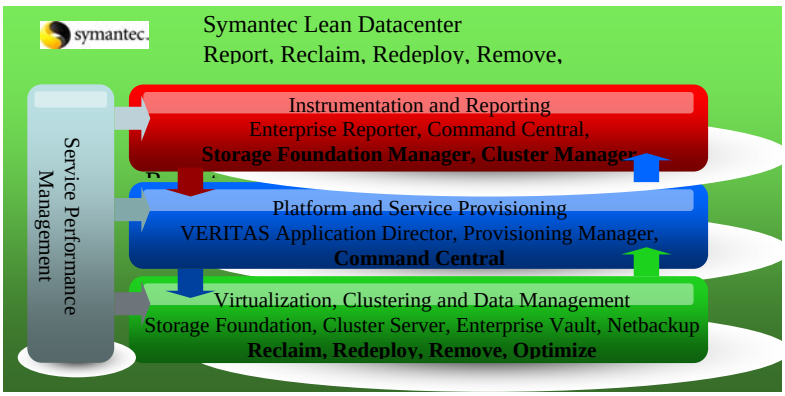


This graph shows the loss between grid generation and the power delivered to Servers or Storage. Power is paid for as it enters the Data Center (circled).

Data Center infrastructures use large amounts of power; so small IT-rack power reductions can yield large Data Center power draw reductions and CO2 footprint reductions (see the two red circles).

the green grid[tm] - a consortium which includes major system and software vendors - surveyed major Data Center operators, measuring typical ratios between the power consumed by a Data Center and the power delivered to IT racks of 3:1. This ratio is called the Data Center *Power Usage Effectiveness*[1] (*PUE*). Ideally, it would be close to 1. ***the green grid***[tm] suggests that good Data Center design can reduce the *PUE* ratio to approximately 1.6-2:1. In order to quantify energy cost and CO2 savings, Symantec used a PUE of 3.

Symantec Energy Efficient infrastructure management



Symantec software products allow customers to manage their server and storage infrastructure, to virtualize, protect, and performance-optimize storage.

They support storage provisioning, reporting, and discovery, and can move data dynamically - array-to-array or storage-tier-to-storage-tier.

Symantec's Data Center Management products can help reduce power draw, thereby reducing utility bills and the carbon footprint required to support individual applications. These reductions can prolong a Data Center's life, preventing it from running out of power and cooling, thereby deferring replacement Data Center construction.

Coupled with a holistic program to improve Data Center efficiency by sourcing more efficient servers and storage, Symantec's Data Center Management products can dramatically impact energy consumption.

[1] http://www.thegreengrid.org

Symantec Energy Efficient Data Center highlights

Symantec provides management products for UNIX, Linux and Windows Servers which help to reduce the number of servers required to support existing applications.

High Availability Clustering

Symantec's *VERITAS Cluster Server*[2] (VCS) fully supports N+1 clusters. Currently, most cluster products and deployments are pairs of active-passive nodes in an high availability (HA) cluster. VCS's unique workload management, resilience and advanced failover logic fully supports N+1configurations, allowing a single active or inactive node to support multiple production nodes.

Using VCS in an N+1 configuration does not reduce availability; but it reduces power draw, reduces the number of required application support servers, and increases utilization.

Consolidating Clusters of IBM P575 Servers

Server KWh/year	Data Center KWh/yr	Power cost/yr	CO2 tons/yr	Offset costs/yr	
363,540	1,090,620	$146,143	469	$9,379	4 - 3 nodes
2,544,780	7,634,340	$1,023,002	3,283	$65,655	16 - 9 nodes

Using a 9 node N+1 cluster instead of 8 dual-node active-passive clusters can reduce power costs by up to $1,023,002[3] per year while reducing the CO2 footprint by up to 3,283 metric tons, which reduces carbon offset costs by up to $65,655 per year.

VERITAS Cluster Server Case Study with Application Clusters

A United States-based wholesale energy supplier uses *VERITAS Cluster Server* (VCS) to provide improved levels of availability and better provision for DR services; simultaneously, VCS's support for multi-node clustering and OS-level Virtualisation has allowed the supplier to increase server utilisation from an average of 10% to more than 35%.

In the process, the Energy Supplier has consolidated from 5 Data Centers to 2 with some of the utilization benefits being delivered by VCS's support for active-active clusters. This active-active support has allowed the energy supplier to use server resources in their DR facility. Previously these systems were running in hot standby mode.

The company was intending to purchase a large IBM P590 server. But the increase in ultilization delivered by the VCS project allowed them to defer this purchase, saving them $500,000. Defering the installation of a new P590 saved 15KW in the Data Center, or 45KW of supply assuming a PUE ratio of 3. Using $0.12 per KW/hr this results in a saving of $47,304 and between 394,200 and 800,000 LB of CO2 depending on the source supply.

Availability has not been compromised by these increases in utilization; in fact, it has increased .

VERITAS Cluster Server with N+1 Clustering Case Study

Since 2002, a multi-billion dollar wireless research and development company has used VERITAS Cluster Server, configured in N+1 configurations, to provide highly available services. These clusters host a range of mission critical applications, and range in size from 2+1 to 8+1 clusters. They mainly use SPARC Solaris platforms, but have recently deployed commodity servers running the Linux operating system.[4]

N+1 clustering has increased utilization without compromising availability, and has yielded more than $2.1 million in hardware and software savings to the wireless company. It is estimated that using N+1clustering has reduced the number of servers (mostly Sun V245s and Sun V490s) the company requires to support their mission-critical applications by a total of 42. The DataCenter power saved is approximately 68 KW, assuming a PUE ratio of 3 the total supply saving is 204 KW.

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[2] VCS details http://www.symantec.com/business/products/overview.jsp?pcid=2247&pvid=20_1
[3] Based on IBM P575 Servers, the UK DEFRA CO2/Kwh, energy costs EMEA 10 average ex VAT
[4] Qualcomm case study
http://www.symantec.com/business/products/customersuccess_detail.jsp?pcid=pcat_storage&pvid=203_1&csid=qualcomm#

Storage Management

Command Central Storage[5] (CCS) from Symantec is the starting point for any serious attempt at storage power-draw reduction. Using CCS, typical returns are 30-40% utilization improvements and 10% of existing tier 1storage data identified for re-tiering

Example of CCS Storage Savings

Customer	Issue	CCS Impact
China Construction Bank	Low utilization of EMC and HDS storage	50% increase in utilization 10TB purchase deferred

CCS allows administrators to report on all the SAN and NAS attached storage. CCS can identify unused storage, which can account for over 30% of the existing storage. CCS can identify over-allocated storage (e.g., under used file systems and database storage). Data which should not be held on disk can be identified (e.g. MP3s). Unused storage can be removed or published to new consumers, over-allocated storage can be reclaimed. Inappropriate data can be removed based on information from CCS.

CCS allows administrators to view the I/O usage of specific applications, this information is essential for informed decisions on which tier in a tiered storage environment to locate the application data.

Finally CCS automates storage provisioning, reducing the time required to provision storage while increasing the reliability of the provisioning operation. Rapid provisioning reduces the amount of storage headroom required to accommodate growth in the environment while more reliable provisioning reduces the chance of storage being provisioned but not consumed - a common reason for under utilization of storage.

Command Central Storage Case Study

One example of a sucessfull Command Central Storage deployment is a large Government Statistics Agency. The agency conduct hundreds of surveys each year in every sector of the economy and society.

Increased governmental usage of statistical data along with more sophisticated data sampling has resulted in a rapid increase in the amount of data the agency holds online.

In order to manage their data growth more effectively, the agency implimented various Symantec Data Center Management products, including Command Central Storage.

The implimentation of Command Central Storage has resulted in a storage utilisation increase of 41%. The agency also predicts a further increase in storage utilisation due to Command Central Storage, which will improve utilisation by 77% around 2010.

Currently this improvement in utilisation has reduced required storage by 250TB. The agency expect this savings to continue, with required storage decreasing by 564TB in 2010.

Based on the agency's current storage platforms (HP XP1024 and HDS 9570V) they will reduce Data Center Power by 170KW in 2007 and 382KW in 2010. Using a PUE ratio of 3, this yields a power saving going into the Data Center of 510KW in 2007 and 1146KW by 2010.

Support Storage Tiering and Archiving

Typically, tier 1 arrays have the highest power consumption per GB of protected storage, while arrays designed specifically for low power consumption - such as the Copan Systems® 220 series - can draw up to 1/64th of the power per GB. Employing tiers, intelligently stratified according to performance, availability and ***power consumption*** will reduce storage power draw. Symantec's Data Center Management products can help non-disruptively migrate data either manually or automatically to lower-performance, much lower-power storage.

[5] Command Central Storage http://www.symantec.com/business/products/overview.jsp?pcid=2245&pvid=19_1

Storage Foundation

Storage Foundation[6] comprises an integrated product suite that provides volume management, multi-pathing[7], a high performance file system, high performance snapshot and array migration capabilities. *Storage Foundation* is supported on Solaris, AIX, HP-UX, Linux and Windows.

Shrinking over allcated filesystems

Storage Foundation allows administrators to shrink over allocated file systems without any interruption in service. This can help recover storage *Command Central* identifies as over-allocated at a file system level.

Simple non-disruptive data migrations for re-tiering

Storage Foundation allows data to be copied from higher tier storage to lower tier storage without service interruptions. If *Command Central* identifies an opportunity to decommission an array, *Storage Foundation* can provide array migration, thereby automating the sometimes complex process.

Keeping data copies more efficiently

One cause of ever-increasing storage growth is the number of retained data copies. *Command Central* can identify how many copies exist and their locations. This information will assist in the removal of some of these copies. For essential copies, *Storage Foundation* supports space-optimized snapshots[8], which dramatically reduce the amount of storage required to support multiple data copies. They also reduce the overhead associated with creating snapshots.

Unlike array-based snapshots, these can reside on lower storage tiers, further reducing power draw.

Automatic data migration between storage tiers

As data ages, its storage requirements may change. Data that was once frequently accessed with high update rates can evolve into data which is infrequently accessed for reporting purposes. *Storage Foundation* supports *Dynamic Storage Tiering*[9], a mechanism which automatically moves file data from one tier to another without service impact based on a range of pre-selected rules. DST can help manage the differences between higher and lower tier arrays, hiding performance differences from applications while reducing storage costs and power draw.

Storage Foundation Dynamic Storage Tiering Case Study

Hewlett Packard has pubished a case study[10] which shows how *Storage Foundation Dynamic Storage Tiering* can reduce the amount of high power consumption tier 1 storage needed to support an Oracle 10g R2 application.

In the case study the application data was initially located on an HP XP12000[11] tier 1 storage array fully configured with 146GB drives mirrored to provide 1.4 TB of available storage for database tables. In this configuration the XP12000 provides storage at .85watts/GB with a total footprint for the application of 1.2Kw.

Storage Foundation Dynamic Storage Tiering was used to migrate data based on I/O usage from the XP12000 to an HP EVA8000[12] configured with 300GB drives using RAID 5. In this configuration the EVA8000 provides storage at 0.08 watts/GB.

Dynamic Storage Tiering was able to migrate 574GB of application data from the tier 1 XP12000 array to the EVA8000 array with around 1000 connected users generating mostly OLTP type transactions to the Oracle Database. The initial data migration took about 13 hours to complete.

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[6] Storage Foundation http://www.symantec.com/business/products/overview.jsp?pcid=2245&pvid=203_1
[7] Multi Pathing http://www.symantec.com/business/products/newfeatures.jsp?pcid=2245&pvid=203_1
[8] http://eval.symantec.com/mktginfo/enterprise/yellowbooks/using_local_copy_services_03_2006.en-us.pdf
[9] DST http://eval.symantec.com/mktginfo/enterprise/yellowbooks/dynamic_storage_tiering_03_2006.en-us.pdf
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[12] HP EVA8000/8001 http://h18000.www1.hp.com/products/quickspecs/12745_div/12745_div.pdf

Storage Foundation Volume Manager and Filesystem then allowed the 574GB of storage released on the XP12000 to be reclaimed for use by another application.

Apart from allowing the application to make use of lower cost storage, *Dynamic Storage Tiering* also reduced the storage power consumption for the application by 37%, saving 439 watts in the Data Center or reducing the total power draw for the Data Center by 1317 watts assuming a PUE ratio of 3.

This is a relatively small data set but serves to illustrate the kind of savings that use of a tiered storage model and intelligent storage managment technology can achieve.

Intelligent Data Archiving and Retrieval

Regulations are forcing organizations to retain email, messaging and file data for longer. Retrieval is now a major issue. Symantec's *Enterprise Vault*[13] intelligently archives files, messaging, and email data from filters and email servers to lower-tier archive storage. Data can also be single instanced, further reducing storage. *Enterprise Vault* also provides advanced retrieval and search options. Using this product family allows organizations to reduce the power draw associated with email, filers and messaging, while also freeing up CPU resources on mail servers.

Archiving data using *Enterprise Vault* can also allow email and file data to be moved from high power consumption tier 1 or tier 2 storage to much lower power consumption archive storage.

Enterprise Vault case study

For an independent law firm based in the Netherlands, Belgium and Luxembourg, email is a key business tool used to communicate legal and procedural information inside and outside the company. The law firm accumulates 5GB of email each day, which needs to be retained for minimum of 7 years. The firm uses a solution based on Enterprise Vault and Plasmon AA638 archive storage devices to migrate email data from primary storage to archive storage.

Using this solution to manage email data more effectively, the law firm will reduce their power costs by 60,000 euros over a 5 year period. This calculation does not include the Data Center Power costs.

Data De-Duplication

One way of reducing the overhead associated with holding multiple data copies uses de-duplication technology to identify common data and reduce copies to a single entity. *NetBackup PureDisk*[14] provides this capability for data centers and at remote WAN-connected sites. *PureDisk* is integrated into Symantec's *NetBackup* product suite and provides an automatic and transparent mechanism to dramatically reduce the number of copies of data, such as Word documents. Transparent to applications, *NetBackup PureDisk's* de-duplication can make full copies when desired. De-duplication rates of 98% are common, which can dramatically reduce the amount of disk storage required for archiving purposes as well as the number of tapes and tape drives required for backup purposes.

[13] Enterprise Vault http://www.symantec.com/business/products/overview.jsp?pcid=2244&pvid=322_1
[14] NetBackup PureDisk http://www.symantec.com/business/products/overview.jsp?pcid=2244&pvid=1381_1

Energy Efficient Applications, performance management and performance optimization

Effective performance management is essential to help prevent server and storage bloat due to poor application or database configuration and inefficient software.

Example of i^3 Hardware Savings

Customer	Issue	i^3 Benefit	Hardware Saving
British Telecom	Poor Java, Tuxedo and Oracle application throughput	207% better throughput with the same hardware	Deferred $228,000 planned spend on Servers + Storage to improve throughput

IT organizations tend to over-provision server and storage hardware to solve performance problems. *Symantec* i^3[15] provides a unique end-to-end performance management, monitoring, diagnosis and fix solution. In the majority of cases i^3 users find it provides simple solutions to complex throughput problems.

i^3 solutions usually involve minor configuration and application or database changes. These changes generally do not involve provisioning more server or storage hardware, and often significantly reduce the server and storage footprint required to support applications. Modern servers with effective power management use less power when they are less loaded.

i^3 supports most UNIX and Linux platforms, Windows, Oracle, Sybase, DB2 and SQL-Server, most common web servers, Java and J2EE, .Net, as well as application environments such as SAP and Siebel, storage from EMC, IBM, and HDS and popular middleware such as Tuxedo and IBM MQ.

Intelligent Power Management

Many servers, particularly systems used for development and testing, are dormant out of working hours and during weekends. Symantec's Altiris product suite can automatically shut down groups of servers on a policy basis, likewise restarting them in the same way. This simple mechanism does not increase Data Center capacity, but it can reduce power bills for a large number of systems by over 30%.

Intelligent Endpoint Managment.

Studies have shown that up to 40% of the total power used by IT is associated with corporate endpoints, PCs, Printers, Monitors, PDAs and other associated equipment. Modern office environments are usually air conditioned so all the power consumed by these devices, dissipated as heat, then has to be removed from the environment by air conditioning. Typically this requires 0.6 to 1 watt of power for the conditioning unit to remove the heat produced by 1 watt of power in each desktop device.

Studies have also shown that most PCs are configured with sub-optimal setups, if at all. This problem is becoming so apparent that utility companies in the USA and Canada now offer rebates to customers who can demostrate that their desktops are being effectively power managed[16].

Altiris provides intelligent power management for endpoints, allowing administrators to set power management policies and to apply them to all the endpoints in an envionment. Altiris will also power off and power on devices automatically, turning desktops off outside normal office hours and turning them back on again when required.

Power management in practice

A consultancy specialising in implimenting endpoint power management solutions have recently found that using intelligent power management to reduce the power consumption of desktops and laptops can reduce annual unit power costs by between $10 and $65 per year. That, coupled with utility rebates, can further reduce costs by $25 to $80 per year.

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[15] Symantec i^3 http://www.symantec.com/business/products/category.jsp?pcid=2246
[16] PG&E rebates http://www.pge.com/news/news_releases/q3_2007/070807.html

About the Author

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About Symantec Technology Network (STN)

Symantec Technology Network (STN) is Symantec Corporation's technical information generation and dissemination organization. It distributes a free monthly technical newsletter that discusses timely technology events to 120,000 email subscribers across the globe. STN also publishes technical data storage and security articles each month for large enterprise and Small and Medium Business (SMB) readers, as well as hosts a variety of blogs and product discussion forums discussing Symantec product tips and insights. To subscribe to STN's Technical Newsletter and review other STN materials, please visit STN at:
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