

FIVE KEY STRATEGIES FOR A GREENER DATA CENTER

SIMPLE AND EFFECTIVE STEPS YOU CAN TAKE TODAY FOR A MORE EFFICIENT ENVIRONMENT

GLASSHOUSE WHITEPAPER

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GREEN DATA CENTERS ARE ALL ABOUT COMPANIES CUTTING COSTS WHILE MAKING THEIR CONTRIBUTION TO A CLEANER ENVIRONMENT

The U.S. Environmental Protection Agency (EPA) reports that data centers in the US consumed 61 billion kilowatt hours (kWh) in 2006 - 1.5% of all U.S. energy consumption - and cost \$4.4 billion to operate. The report also estimates that this could increase to 100 billion kWh and \$7.4 billion by 2011.

The EPA's assumptions could be rather conservative, however; Gartner believes that a projected 15% CAGR (compound annual growth rate) of the high-volume, high-density servers could add another 10% to 15% to these figures.

Going green is clearly on everyone's mind. It is only a matter of time before every company will be forced to talk about their IT (and data center) operations in terms of their carbon footprint. This paper is not intended to be a diatribe on rising temperatures and sea-levels, and is not meant to give the reader advice on the effective recycling of office waste. Instead, the goal is to raise the awareness that the concept of a green data center need not be a big splash effort - it can start small. By following some simple but practical steps, you will quickly have an operation that is truly "green" - both economically and ecologically speaking.

A green data center is not about a "me-too" operation. It is not a one-time task that you can check off from your to-do list. Establishing a 'green' environment is an approach that requires evaluating and changing processes as well as technology. So if you are planning to go green as a formality, then this paper is not for you. However, if you truly believe a green data center is a value proposition your company will benefit from for the long-term, then this paper will help you achieve just that.

A green strategy represents a paradigm shift in the way which IT will be managed. A carbon neutral IT department may be a bit further down the road, but by taking initiatives to greening your data center, you are planting the seeds. A green data center is all about reducing its footprint, lowering costs and consciously making environmentally-friendly decisions.

If every IT department had to make do with only a handful of servers, we would not be discussing this topic. A simple rack full of servers is a myth. The computing needs of today's enterprises are insatiable and increasing in leaps and bounds on a daily basis. Traditional provisioning practices mean you continue to increase the systems and storage footprint, thus increasing energy costs. Add to that the tendency to have an

over-built infrastructure and you quickly see the impact a data center operation can have on overall energy consumption.

A green data center does not have to be an all-or-nothing proposition. One could argue that several 'nice-to-have' technologies are either in a fledgling or nascent state, making their adoption a bit risky; especially if you tend to be risk-adverse. However, there are many options available today that, if adopted in a judicious manner, can make an immediate impact on the budget. In other words, start small, do not wait for all technology to be mature (is there such a thing?) and more importantly, do not procrastinate. The time is now.

Let us start by examining some of the areas that offer potential cost savings.

Top Focus Areas

1. Consume Intelligently
2. Consolidate Your Systems
3. Manage Storage Resources More Efficiently
4. Invest in a Greener Infrastructure
5. Consolidate Your Data Center Footprint

CONSUME INTELLIGENTLY

All devices do not consume the same amount of energy. Nor is it sufficient to just have an Energy Star logo on the box. If you have servers that are a few years old, chances are they consume more energy than more recently manufactured servers. If you are refreshing equipment in your data centers, it is time to add another item to your selection criteria - energy consumption. This should not necessarily be your over-riding criteria, but if during the comparison process, the numbers for a particular model stand out, it is worth examining it in detail. Given that "green" is on the mind of a lot of vendors, asking the tough questions will inspire vendors to do more. Challenging customers create more responsive vendors who then develop better products.

Over-provisioned, over-built and over-allocated resources cause wastage. All of those spinning disks, servers and network equipment consume energy. Similar to lean manufacturing, IT departments should adopt a lean provisioning practice, allowing provisioning to occur on an as-needed basis. Many companies have lengthy provisioning processes that can take months to actually get equipment into the data centers. Changing the process is by no means easy. However, just because the device is sitting on the floor does not mean it needs to be powered on and generating heat.

Audit your systems regularly to see if they are being used or not. If the service they run does not warrant the system capacity, move it to a virtual machine. In conjunction with this audit, ensure that energy savings hooks and software configurations are implemented to make use of the energy savings capacity of the hardware in use.

Consequently, investigate recycling technologies for old equipment. If you have a buy-back or trade-in program with your vendors, insist on knowing how they dispose of old hardware. If you would rather recycle it yourself, there are vendors who will convert your equipment into scrap metal that can then be recycled. You accomplish two objectives in the process: data security and environmentally friendly recycling.

IMPROVE ASSET UTILIZATION - CONSOLIDATE YOUR SYSTEMS

During any 24-hour period, less than 10% of the available computing power of x86 servers is being used, (Gartner, 2007). The picture is slightly better for RISC/Unix machines, at 20% during a 24-hour period, whereas a typical mainframe environment can achieve between 70% and 80%.

What does this mean? Consider consolidating your systems resources and improve server utilization. Systems consolidation usually means virtualization, however, it could also mean investing in blade server technology.

Systems virtualization comes in all shapes and sizes. Going virtual is no longer just a new trend but is becoming necessary to reduce costs and improve provisioning times. The good news is that this technology is here to stay and will only get better as time goes by. The list of vendors offering some form of systems or application virtualization platform also grows longer every day.

Systems virtualization, which was once dominated by players like VMware, is now getting competition from many others offering similar, and in some cases superior, technologies. Systems vendors like Sun, Microsoft, IBM, HP and even Oracle, in conjunction with either their own or with microprocessor vendors like AMD and Intel, offer hardware and/or embedded virtualization platforms. What this means for you is that you now have much better control over matching your requirements to the technology. VMware is still the leading player in this space and offers the most supported platforms. However, it lacks in some key areas: notably, integration with hardware virtualization from the microprocessor vendors.

The key benefit of systems virtualization is the ability to reduce the server footprint in your data center. In other words, virtualization leads to physical consolidation. Consolidation is especially beneficial in scenarios where there are a lot of parallel environments in addition to the production environment. These can all be moved into virtual space, potentially removing racks and racks of physical servers.

Blade systems offer similar benefits to virtualization, but have the added advantage of being able to handle platforms that cannot be virtualized due to limitations of any kind. So before you dismiss blade systems, take a closer look at what the various blade technologies have to offer in terms of consolidation. Blade technology was once written off as wasteful, but thanks to the perseverance of a few vendors, it is making a comeback – for the better. Technologies, such as Infiniband, now make it easier to consolidate to a

blade server farm. iSCSI allows you to make use of your existing IP infrastructure than a full build out of a new Fibre Channel infrastructure.

On the storage virtualization front, the benefits are less intuitive. While storage virtualization by itself does not provide any tangible benefits, the derived benefits are immense. A key benefit of systems-transparent storage virtualization is storage mobility across multiple arrays. Data mobility offers the ability to create multiple storage tiers each with its cost footprint. Data can therefore be classified and moved to or stored on the appropriate tier-based on its need and value. In this scenario, an additional tier classification component can most certainly be energy consumption.

MANAGE STORAGE RESOURCES EFFICIENTLY

As the appetite for data increases, so does the storage footprint. In the past, most storage utilized by servers was in the form of a few shelves of dedicated disks. These days, it is hard to find any data center that does not have any storage frames. In most data centers, these frames account for more than 30 % of the overall footprint. Their energy consumption requirements are immense. Not only do they consume a lot of electricity but also spew heat into the air, requiring stronger HVAC installations. At the end of the day, it all comes down to one thing: spinning hard drives. The dependency of energy consumed is directly proportional to the number of these disks. Cutting the number of spinning disks can reduce the overall storage energy consumption. There are several ways you can accomplish this. A traditional approach is to migrate to higher density drives and in the process retire smaller older drives.

At the same time, invest in newer technologies that aim to change the way you provision. One particular technology, called thin provisioning, is gaining ground. Some vendors call it virtual provisioning. It allows you to provision all storage from a common pool, but it only "allocates" what is used by the host. In almost every environment we've assessed, storage is over-allocated but heavily under-utilized. On average, the utilized to allocated ratio never exceeds 20%, after factoring in array and systems overhead. That's huge wastage when you consider that storage is not cheap, unused storage is difficult to recover (because, lets face it, who wants to give up such a prime piece of real estate) and most important of all, storage budgets are constantly being squeezed. From an energy savings perspective, thin provisioning is great. You only add physical resources as the need arises. Coupled with storage tiers, thin provisioning can change the way in which storage is viewed: it goes from being a big overhead to a much nimbler resource.

Database and data compression for online storage is slowly becoming reality. Oracle, for example, has introduced database compression in its 11g suite. It promises to reduce the amount of storage used up by databases.

You can be smarter about how you backup your data as well. Reducing the amount of tape consumed, as well as how backups are stored onsite, can reduce wastage and save money. Investigate wasteful redundancy in the number of backup copies being created

and stored. Invest in appropriate data de-duplication and compression technologies. Data de-duplication, like thin provisioning and virtualization, is becoming popular and is here to stay. Discussion of the different types of de-duplication technologies is beyond the scope of this paper, but do engage the proper subject matter experts to evaluate which technology offers you the best value for your investment.

INVEST IN A RIGHT-SIZED AND GREENER INFRASTRUCTURE

Infrastructure can be classified into two categories – energy and facilities. Energy includes power, lighting and cooling, whereas facilities includes physical infrastructure such as flooring, racks, fire codes etc. If the data center is planned correctly, it ensures uniform power consumption, avoids wastage and saves on costs.

According to a 2008 survey by Gartner, most respondents saw Green IT as a power and cooling issue. Several data center infrastructure companies advertise green products, however, this area can get a bit tricky, as many times the technology choices that are appropriate for your specific environment are not obvious.

Gartner estimates that the underlying consumption of energy in large data centers will continue to rise during the next 10 years. What that means for you is that unless you start now, the energy consumption in your data center will only increase.

From an energy perspective, taking a just-in-time as well as a modular approach to building out the air-conditioning and power requirements ensures that floor space is not cooled beyond what is necessary to maintain an ambient temperature. A lot of air-conditioning does not necessarily mean cool air. Proper HVAC planning is critical, so invest in energy efficient HVAC systems and consider leveraging an expert to help determine which systems work best for your new environment. Keep in mind that your data center need not resemble an Antarctic deep freeze. Maintaining the ‘just-right’ temperature goes a long way in saving on cooling costs.

By investing in eco-friendly, power-efficient lighting systems, you can save on a lot on your electricity bills. Be prudent about which areas need to be lit at all times. Your data center ought to be functional – no more, no less. Bright lights 24/7 are only a sign of seasonal holiday jollity when decorating your house, not your server racks. Consider investing in motion detectors that switch off lights after a period of inactivity. Invest in energy friendly racks that are designed for optimal air flows. Vented floor tiles ensure that the cooling systems are not stressed due to imbalance. When building out a new data center or updating an existing one, you should insist on the use of environmentally-friendly building materials. Minimize the use of toxic and non-recyclable materials whenever appropriate.

Consider the concept of facility tiers. If you believe that placement of your equipment based on its value to the business is critical in providing proper data center floor space, then non-production equipment can be located in a different, less redundant, lower tier

section of the data center. Facility tiers allow you to build out the infrastructure according to the business criticality of the applications they service.

Investing in a lights-out infrastructure minimizes the need to staff the data center with full time resources, as long as they can be available in a reasonable amount of time. A lot of the operational tasks that require physical intervention can be handled using “remote management” cards. Most vendors include this hardware as a part of their systems. Third party equipment that can perform such tasks is also relatively inexpensive and is a valuable investment for legacy equipment.

CONSOLIDATE YOUR DATA CENTERS

This may sound like old, obvious advice, but we are often surprised by the amount of wasted data center floor space. Companies over-build floor space, acquire additional data centers as a part of M&A activity or simply are not able to move their systems out of older data centers. As long as growth is anticipated, companies should make every attempt to consolidate their data center space. If the built out floor space of a data center is less than 20 % utilized, it needs to be examined for alternatives. This is not to say that companies should put all their proverbial eggs in the same basket but the goal should be to cut costs, and in the process reduce energy consumption. Having fewer data centers to power and maintain achieves that goal.

Gartner estimates that over 50% of large enterprises will face a shortage of available appropriate data center floor space during the next five years. If you find yourself in this position, explore alternative options to fully building out a new data center.

One option to investigate is co-location with a hosting provider. Co-location has the potential to be less costly than building your own infrastructure. Co-location is especially helpful when you need a functional site for business continuity or operational recovery but do not expect to ever be in full production out of that facility.

MEASURE THE CHANGES

Nothing is as satisfying as looking back on the positive impact your changes have on the data center infrastructure. It is imperative that you track these changes to quantify the cost savings. Maintain a dashboard, define success criteria and more importantly, create a plan and stick to it. Think about the impact on your data center in terms of the carbon footprint and the quest to make it net neutral.

CONCLUSION

A green data center is not about losing sleep. In fact, it is about giving you peace of mind, knowing that you have done everything you can to ensure you saved on costs while making your data center environmentally friendly.



ABOUT GLASSHOUSE TECHNOLOGIES, INC.

GlassHouse Technologies is a global provider of IT infrastructure services enabling organizations to consolidate, virtualize and manage their IT environments. GlassHouse delivers services through TransomSM, a unique process framework comprised of software tools, proprietary methodologies and best-in-class consultants. We reduce costs, decrease risk and improve service levels by providing accelerated, measurable results, vendor independent solutions and transparency in the IT environment. GlassHouse focuses on the storage/data protection, virtualization and data center markets.