# Energy management strategies and data center complexities require new solutions

As a provider of specialist logistics services to the UK healthcare sector, Polar Speed needed to be able to deliver levels of service that most mid-sized businesses would struggle to achieve. With rapid year-on-year growth, the performance of its existing IT infrastructure was beginning to suffer.

Working with Omicron Solutions, an IBM Business Partner, the company replaced its existing servers with an IBM BladeCenter containing Intel Xeon processor-based blade servers, and a fiber-connected IBM System Storage™ DS3400 provides SAN storage for the whole environment. The highly scalable IBM BladeCenter architecture is designed to support future growth with minimal additional investment, saving data center space and reducing both electricity costs and the carbon footprint.

For enterprises today, reducing costs and complexity is key to maximizing the business value of IT systems and services.

One particular pain point applicable in this context: energy costs in data centers. Today's data centers commonly generate 10 to 30 times the electrical overhead of a typical office building[1]— the fastest-growing element of the data center cost picture. Already, electricity costs are estimated by some analysts to account for roughly 40% of the total data center budget.[2] This trend is threatening fiscal resources that might otherwise be allocated to revenue-generating services. Going green is therefore increasingly critical to achieving and maintaining a competitive advantage.

Exacerbating this challenge is the fact that many organizations continue to suffer from server sprawl. When new servers are rolled out on a one-to-one basis with new applications or services, overall costs become multiplied in proportion. Each server draws more power and generates more heat, which in turn must be dissipated—leading to further costs.

Because hardware utilization tends to be poorer for lower-end servers, this situation also leads to suboptimal use of overall processing power, wasting precious computational resources. Management and administration actions are also inherently complicated, leading to less agility in the pursuit of changing business goals and strategies.

Overall business resilience can be threatened by poor energy management—many of today's data centers were simply not designed to scale in proportion to growing electrical demands. For them, server sprawl as an ongoing situation can be potentially catastrophic.

Finally, many of today's organizations are increasingly concerned with environmental stewardship—the general responsibility of the corporate sector to improve ecological conditions by lowering energy consumption and reducing carbon emissions—in order to help achieve a sustainable, balanced world for future generations.

Here, too, optimizing data centers through energy-efficient solutions can lead to substantial improvements. Going green leads not just to lower costs, but also to lower carbon emissions—in short, a measurable environmental benefit for the host community and, in a larger sense, the global ecosystem.
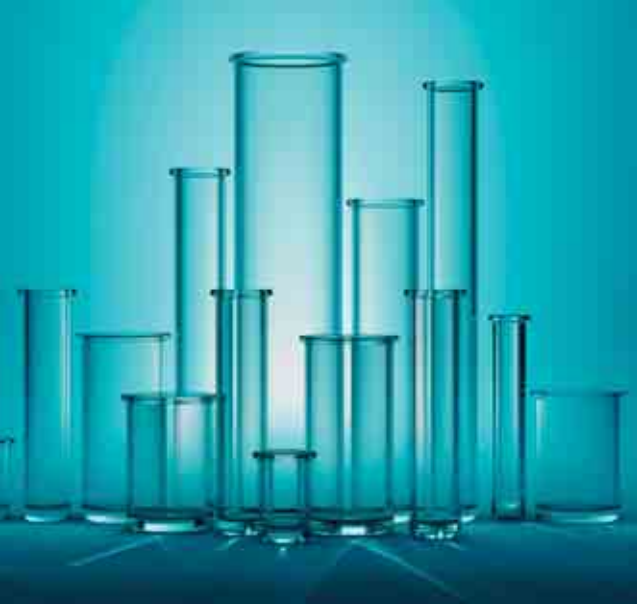
Colorado-based HealthTrans, a pharmacy benefits administrator, is responsible for processing 90 million claims annually. The computational challenges implied by that workload are considerable, and HealthTrans was looking to improve its overall speed, flexibility, and capacity to achieve 24/7 claims processing availability.

Their system selection? IBM Power 570, driven by IBM's POWER6 processors and IBM PowerVM virtualization management. Since migrating from Sun servers to the IBM offering, HealthTrans has experienced higher application uptime, faster performance and enhanced flexibility, allowing for rapid capacity changes on demand.

And at a time when organizations compete in an increasingly green-conscious marketplace, the organizations that have moved to energy-efficiency solutions and strategies will be perceived more favorably by clients and customers—a clear competitive distinction.

## Why IBM?

For these reasons, many organizations are turning to IBM solutions to consolidate servers, lower overhead, simplify management and spur business innovation.

Organizations that have deployed other solutions will find that IBM offers unique, compelling strengths and advantages that generate overall gains in many different business and technological contexts.

Among these core strengths are:

- *A comprehensive array of virtualization technologies, which can deliver dramatic improvements in hardware utilization and energy efficiency.*
- *Innovative processor and systems technologies designed to maximize computational power while minimizing power requirements.*
- *A full suite of tools capable of tracking power consumption, heat output and other variables, thus delivering key diagnostic and measurement information used to fulfill energy management strategies.*
- *High scalability and consolidation capabilities.*
- *Storage solutions that scale effectively and integrate seamlessly with existing infrastructures.*

With IBM System x™ and IBM BladeCenter® systems, IBM Power™ Systems, and leading storage solutions, enterprise-class IT can be empowered as a superior instrument of business initiatives—more energy-efficient, more flexible and more powerful.

## Reduce complexity and enhance IT responsiveness

How can organizations improve IT agility and minimize server sprawl? One strategy involves transforming physical servers into multiple virtual servers, then running them on a single host system. In this way, IT can add virtual servers to match the host's processing power, and thus increase hardware utilization—maximizing asset ROI.

According to one recent study conducted by IBM, up to 112 Dell 1U servers can be consolidated into an IBM BladeCenter JS22. This IBM BladeCenter solution delivers the same computational power of the 100+ Dell servers, yet requires only a fraction of the power and generates a fraction of the heat[3]—a clear win by any metric.

IBM's value proposition as a systems provider is also evident in the new Power 520 Express—i Edition®—an affordable upgrade path for current IBM AS/400®, IBM System i520®, and iSeries® customers, who can leverage it to reduce server sprawl and the associated energy costs. It also enables an exceptionally diverse array of applications and services from a single host.

Centrinet, a UK organization that provides IT management services, had a unique idea: build a data center, known as Smartbunker, designed to run efficiently on entirely renewable energy and to offer this as a hosting service to clients.

The solution proved to be IBM BladeCenter, which integrates servers, networks, storage and applications in 1-inch deep blades that sit in a rack like a bookshelf.

"Right from our first dealings with IBM, we were very impressed," said Kelly Smith, Managing Director at Smartbunker. "We weren't an IBM customer prior to this, but we were aware of its green credentials, and that undoubtedly helped. The products put forward by other companies couldn't match IBM's in terms of performance, energy efficiency or reliability. The solution we chose will also help us to expand the business very quickly, without any concerns about overloading our IT infrastructure."

Furthermore, IBM BladeCenter S has built-in disk storage of up to 12 terabytes; competing HP solutions, by contrast, must sacrifice blade servers to obtain extra storage.[4] And helping to reduce management complexity is the IBM BladeCenter Open Fabric Manager, which simplifies I/O administration and works with all IBM BladeCenter Ethernet and Fiber Channel switches and fabrics from leading vendors such as Cisco, Nortel, and QLogic.

Also new is the IBM Power Systems line, which brings together IBM POWER-driven IBM System p™ and System i offerings into a new, unified suite. The Power Systems line supports three different operating systems—UNIX®, IBM i, and Linux®—helping to maximize the total range of applications and services available from each server. With IBM PowerVM™, new virtual servers can be deployed far more rapidly than new physical servers—and each receives dynamic allocation of computing resources—such as memory—on demand.

Perhaps the most common form of server sprawl revolves around low-end, x86 servers. Clients looking for exceptionally high-end x86 servers designed for mass consolidation should consider the IBM System x3950 M2, which delivers extraordinary virtualization performance and scalability thanks to IBM's fourth-generation eX4 technology,

up to a full terabyte of RAM, and as many as 16 Quad Core Intel® Xeon® processors.

Also available from IBM: Balanced Configuration Units, which integrate different systems and software, optimized for different business contexts. These units are tested in advance and are designed to deliver specific performance levels for their target services.

For clients making the leap from alternate vendors to IBM, the transition process doesn't have to be a daunting one. For such organizations, one option sure to be attractive is IBM Makeover Services, which are designed to optimize the transition process and thus reduce business risks and operational costs through the IBM Migration Factory.[5]

**Increase energy efficiency and decrease costs**

Getting the best business value from IT means more than just increasing power and flexibility—it also means keeping IT efficient by minimizing costs. Toward that end, solutions designed for virtualization and consolidation deliver quantifiable benefits. When the total number of servers falls, energy costs and generated heat can also decrease. IBM delivers many powerful features across many product lines, all designed to enable and drive energy management strategies.

Rabobank Group, a full-range financial services provider founded on cooperative principles and a global leader in sustainability-oriented banking, found that as new internal systems were added and external services launched, the number of servers in the data center grew.

To consolidate, Rabobank worked with IBM Global Services to design a new architecture based around the IBM System p™ platform running IBM AIX® 5L™ V5.3. The architecture replaces the previous "one application per physical server" model with virtualized servers running on standard physical "building-blocks": IBM System p5™ 570 and 560Q servers, each with 16 IBM POWER5+™ processors.

IBM BladeCenter, for instance, allows IT to get the most processing power in the smallest physical footprint, even when compared to rack units. The IBM BladeCenter E holds 14 servers in 7U of rack space—a 50% improvement in comparison to seven 1U servers. Yet, that same BladeCenter E, based on IBM engineering test data, will require as much as 35% less power.[6] This reduction comes thanks to many special enhancements, such as low-power processor options, energy-efficient power supplies, IBM Calibrated Vectored Cooling™ to maximize airflow, solid-state drives, a shared-cooling design, and IBM Systems Director Active Energy Manager™, an IBM diagnostic and management tool.

Furthermore, a strong competitive advantage is apparent when IBM BladeCenter solutions are compared to those from other vendors. According to the Edison Group, the IBM BladeCenter H required almost 10% less energy than an HP Blade System c7000 using comparable configurations.[7] The IBM advantage is even clearer when we take a holistic approach to energy efficiency and utilize IBM BladeCenter unique innovations like the energy efficient IBM BladeCenter E chassis, Solid State Drives and IBM Systems Director Active Energy Manager along with Intel low

voltage processors. With these innovations in place, we can reduce the amount of energy required by an additional 25%.[8]

Among x86-based servers, the IBM System x offerings deliver exceptional energy efficiency—stemming in part from their DDR2 memory as opposed to FB-DIMMs. Multiplied across many consolidations, this design optimization alone can lead to substantial returns, as it did for Staybridge Suites in Florida, which reduced energy costs 35% simply by migrating all lower-end servers to a single System x3950.[9]

For customers running IBM Power Systems, PowerVM and POWER6™ EnergyScale technology similarly helps drive down energy consumption, especially by comparison to other vendors. In fact, when compared to a 64-core HP PA-RISC Superdrome, an eight-core IBM System p 550 can reduce electric consumption by up to 91%, while also achieving 16% more database transaction performance.[10] And for customers migrating to IBM Power Systems solutions from multiple competing servers, the energy management argument will be even stronger. Up to 180 Sun SunFire V490 servers, for instance, can be consolidated onto a single rack of the IBM BladeCenter JS22, leading to a staggering energy reduction of 92%.[11]

AISO.Net, the world's first and only 100% solar-powered web hosting company, serves more than 12,000 customers worldwide and is committed to being the best, most reliable eco-friendly hosting company in the world. This commitment resulted in Live Earth producers selecting AISO.net to host the liveearth.org Web site.

To host the site, AISO.Net custom designed a dedicated, reliable solution using energy efficient IBM BladeCenter servers with Second-Generation AMD Opteron™ processors. " We can run the Live Earth Web site on IBM BladeCenter and get great performance without having the power draw we would have had with rack servers, " said Phil Nail, technology manager for AISO.Net, in explaining their platform selection.

**Reduce server and storage costs and simplify administration**

Storage represents another excellent opportunity to realize improved business value through IBM solutions. Via tiered storage architecture, organizations can assign higher performance to the services that need it the most, and reduce costs by mapping lower-performance storage to lower-priority services. Nevertheless, many organizations have yet to move to tiered storage architectures.

IBM can help. IBM storage solutions are designed to ensure that performance and features are closely aligned with dynamic business requirements. One key solution in this category: the IBM SAN Volume Controller™ (SVC), which provides a single logical point of management across all tiers. SVC also enables storage to be treated as a logical resource that can be allocated and retrieved in proportion to changing needs—this helps IT achieve superior storage utilization, making the most of available storage space rather than requiring the purchase of more storage devices. Besides, SVC is the industry's highest performing, most mature storage virtualization solution, unmatched by any competitive offering. How successful has it been in today's ultra-competitive storage market? Since its introduction to the market in 2003, IBM has shipped over 12,000 SVC engines running in more than 4,000 SVC systems.[12]

Server costs, similarly, can be better controlled and reduced through IBM solutions. Consider that IBM BladeCenter delivers 25% better density compared to competing blade-based offerings,[13] while also doubling typical rack unit density. This physical consolidation of computational power means that, just as with storage, IT is empowered to accomplish more with fewer resources—a clear example of reduced costs and simplified administration.

IBM System x3850 M2 and x3950 M2 deliver potent features and functionality, pairing industry-leading performance with the industry's lowest total cost of ownership by product class. This is due to the processor-rich architecture, which boasts 16 sockets—twice that of other offerings. Twice the power translates into half the total number of required servers for any given IT application; this, in turn, can lead to a substantial reduction in overall costs. IBM enterprise servers are designed with high-efficiency power supplies and CPU/memory regulators that deliver 15% less power than the HP ProLiant DL580 G5 server leading to savings of 42% less per server per year.[14]

And the cost reduction story is even more impressive in the case of IBM's Power Systems line. According to a 2007 whitepaper from the International Technology Group (ITG), the average savings for organizations that consolidate servers on these IBM hosts is a remarkable 65-70%. An ITG study says that IBM delivers the lowest overall TCO across the entire UNIX systems space.[15]

Transplace, a leading logistics provider, was looking for a way to deploy software as a service, maintain 24/7 application availability, launch new services rapidly, and minimize IT operations costs.

Achieving these goals meant new systems, and Transplace turned to IBM. The eventual solution? IBM Power 570 servers, for exceptional computational power via fewer processors—translating into improved scalability and substantial overall cost reductions in software licensing.

"We discovered that servers using IBM POWER6 processors at the database layer would let us deploy fewer but faster processors," said Vincent Biddlecombe, CTO of Transplace. "This let us further lower our Oracle licensing costs."

## Drive business value with leading performance and price/performance

As companies strive to compete more effectively, deploying and orchestrating varying IT services dynamically to correspond with changing business goals, strategies and performance is a key ingredient to success. And when compared to solutions from other vendors, IBM systems—both modular and POWER-based—deliver exceptional performance, performance/watt, and price/performance.

How exceptional? In the case of the IBM System x3850 M2 enterprise server, a virtualization performance comparison conducted by Principled Technologies showed a 27% superiority in performance per watt when compared to the HP DL580G5.[16] What's more, the same system showed an overall TPC-C performance superiority of 27%. And for the maximum in System x-based performance, consider the System x3950 M2, which offers the highest x86 TPC-C benchmark ever recorded as of February 2008, nearly 62% more transactions per minute than the Unisys® ES7000/one Enterprise Server's 8-processor result of 520,467 tpmC and 12% more than their 16-processor result of 749,839 tpmC.2.[17]

Blistering throughput is also a key aspect of IBM Power Systems solutions. Compared to mid-range competitors such as the Intel® Itanium®, IBM's POWER6-based processors have been shown to offer two to three times the overall performance across a wide variety of benchmarks targeting different workloads and classes of computational performance.[18]

IBM also offers tremendous performance per watt in the case of the new, watercooled POWER 575 supercomputer. This model, a computational wizard driven by 224 POWER6 processors, incorporates innovative, water-chilled copper plates over each microprocessor to deliver high performance while minimizing generated heat. The outcome? More than five times the performance and three times the energy efficiency of the POWER5+™-based model 575[19]—literally eight trillion operations in a heartbeat's time.

High-end IBM storage systems also offer extremely efficient design for high availability without compromised performance. The DS4000, for instance, a RAID6 system, delivers exceptional throughput—within 3% of an equivalent RAID5 configuration despite the added system activity.[20]

Companies around the world have saved money by migrating from competitive UNIX servers and consolidating on IBM Power Systems. For instance, Energen, one of the top 20 independent oil and gas exploration and production companies in the United States, was able to save more than $500,000 annually by consolidating 20 Sun servers onto two IBM Power 570 servers. The project accelerated new server deployment from one month to two days.

"The server consolidation project was hugely successful," said Brunson White, vice president and CIO of Energen. "We have never completed a project that has so quickly generated as much return on investment as this one. And we achieved increased system performance as well."

### Summary

Maximizing IT business value means getting as much performance as possible from IT assets while simultaneously managing costs—both now and in the future. This is particularly true in the domain of energy efficiency; as data centers have grown more complex, their energy consumption has scaled up rapidly to the point where it now comprises the fastest-growing element of overall data center costs.

Fortunately, IBM offers a broad array of leading server and storage solutions designed to fulfill operational performance goals while also empowering energy management strategies. As energy costs rise, revenue that would have been required for them can instead be directed toward strategic new products and services—a major win for the organization.

Cost reductions are only half the story; when organizations pursue business goals they must also consider the potential environmental impact of their operations. By decreasing the energy required by data centers, organizations also help eliminate environmentally harmful carbon emissions, thus directly benefiting both local communities and the global ecosystem.

Such responsible environmental stewardship on the part of the organization can also translate into improved public perception by clients and customers; as energy management is optimized and carbon emissions diminished, the organization's brand is strengthened.

By moving up to IBM, today's organizations can achieve a comprehensive response to the many growing challenges facing IT today—scaling up energy efficiency and agility and scaling down costs, carbon emissions, and management complexities, to render IT a powerful yet cost-effective vehicle in the pursuit of changing business goals.

### For more information

To learn more about energy efficiency in data centers, please contact your IBM marketing representative or IBM Business Partner, or visit the following Web site: **ibm.com**/itsolutions/energy-efficiency/

[7] Edison Group, "Blade Server Power Study: IBM BladeCenter and HP BladeSystem," November 2007.

[8] See footnote #4 on M2I web page: http://www-03.ibm.com/systems/migratetoibm/systems/bladecenter/.

[9] http://www-03.ibm.com/systems/x/resources/videos/CoolBlueweb/index.html.

[10] Power consumption figures for the IBM Power 550 and the HP 9000 Superdome were based on the maximum rates published by IBM and HP, found at: http://www-01.ibm.com/common/ssi/index.wss and http://h18000.www1.hp.com/products/quickspecs/11721_div/11721_div.PDF. All systems were compared based on maximum processor configuration. Other configurations of these systems could have lower power consumption.

[11] http://www-03.ibm.com/systems/p/hardware/notices/consolidating.html

[12] http://www-03.ibm.com/press/us/en/pressrelease/21856.wss and http://w3-03.ibm.com/sales/support/ShowDoc.wss?docid=P012521D71501B95&infotype=SK&infosubtype=N0&node=doctype,N0ldoctype,PRRbrands,B5000geography,AMR&appname=CC_CFSS)

[13] With IBM BladeCenter E will fit 14 servers in 7U of space. HP BladeSystem c7000 fits 16 blades in 10U of space. IBM blades take up .5U of space. HP blades take up 0.625U of space. 0.625 − .5 = 0.125. so HP blades are 0.125 bigger. 0.125 / .5 = .25 or 25%.

[14] IBM internal testing shows the following power costs at 24x7x365 server hours per year: IBM - $7,726 per server per year, HP - $13,245 per server per year, With IBM, you could save up to $5,519 per server, per year – a savings of 42%.

[15] "Impact of IBM System p Server Virtualization," Transforming the IT Value Equation with POWER6 Architecture. International Technology Group, May 2007.

[16] http://principledtechnologies.com/Clients/Reports/IBM/IBMvCon0208.pdf.

[17] IBM System x3850 M2 four Quad-Core Intel Xeon Processor X7350 2.93GHz (4 processors/16 cores/16 threads), 516,752 tpmC, $2.59 USD / tpmC, availability March 14, 2008. HP ProLiant DL580G5, four Quad-Core Intel Xeon Processor X7350 2.93GHz (4 processors/16 cores/16 threads), 407,079 tpmC, $1.71 USD / tpmC, availability September 5, 2007.

IBM System x3950 M2, eight Quad-Core Intel Xeon Processor X7350 2.93GHz (8 processors/32 cores/32 threads), 841,809 tpmC, $3.46 USD / tpmC, availability April 1, 2008. Unisys ES7000/one Enterprise Server, eight Dual-Core Intel Xeon Processor 7140 3.4GHz (8 processors/16 cores/32 threads), 520,467 tpmC, $2.73 USD / tpmC, availability May 1, 2007. Unisys ES7000/one Enterprise Server, 16 Dual-Core Intel Xeon Processor 7041 at 3.0GHz (16 processors/32 cores/64 threads), 749,839 tpmC, $3.33 USD / tpmC, availability June 12, 2006.

View all published TPC benchmark results at http://www.tpc.org.

[18] Competitive benchmark results for IBM POWER6, HP Integrity, and SUN SPARC64 high end servers, published July 8, 2008. See http://www.spec.org/power_ssj2008/. TPC-C results can be found at http://www.tpc.org.

[19] The performance is based on IBM estimates and the maximum energy requirement is documented in the Power Systems Site and Hardware Planning Guide SA76-0091-04 http://publib.boulder.ibm.com/infocenter/systems/topic/iphdx/sa76-0091.pdf.

[20] The DS4700 is at: http://www.storageperformance.org/results/benchmark_results_spc1#a00046

[1] Gary Shansoian, Michele Blazek, Phil Naughton, Robert S. Seese, Evan Mills, and William Tschudi, "High Tech Means High Efficiency: The Business Case for Energy Management in High-Tech Industries."

[2] http://www-306.ibm.com/software/tivoli/beat/09252007.html?ca=tivolid2w&me=we

[3] "Consolidation Test of LAMP Applications on an IBM BladeCenter JS22 Express Server" study performed by IBM, November 6, 2007.

[4] http://h18004.www1.hp.com/products/blades/components/c-class-components.html?psn=servers.

[5] April 8, 2008, IBM Press Release: "IBM Unleashes World's Fastest UNIX System, Offers Twice the Performance of HP Itanium System at Comparable Price." http://www-03.ibm.com/press/us/en/pressrelease/23843.wss.

[6] http://www-03.ibm.com/systems/migratetoibm/systems/bladecenter/compare2.html.

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